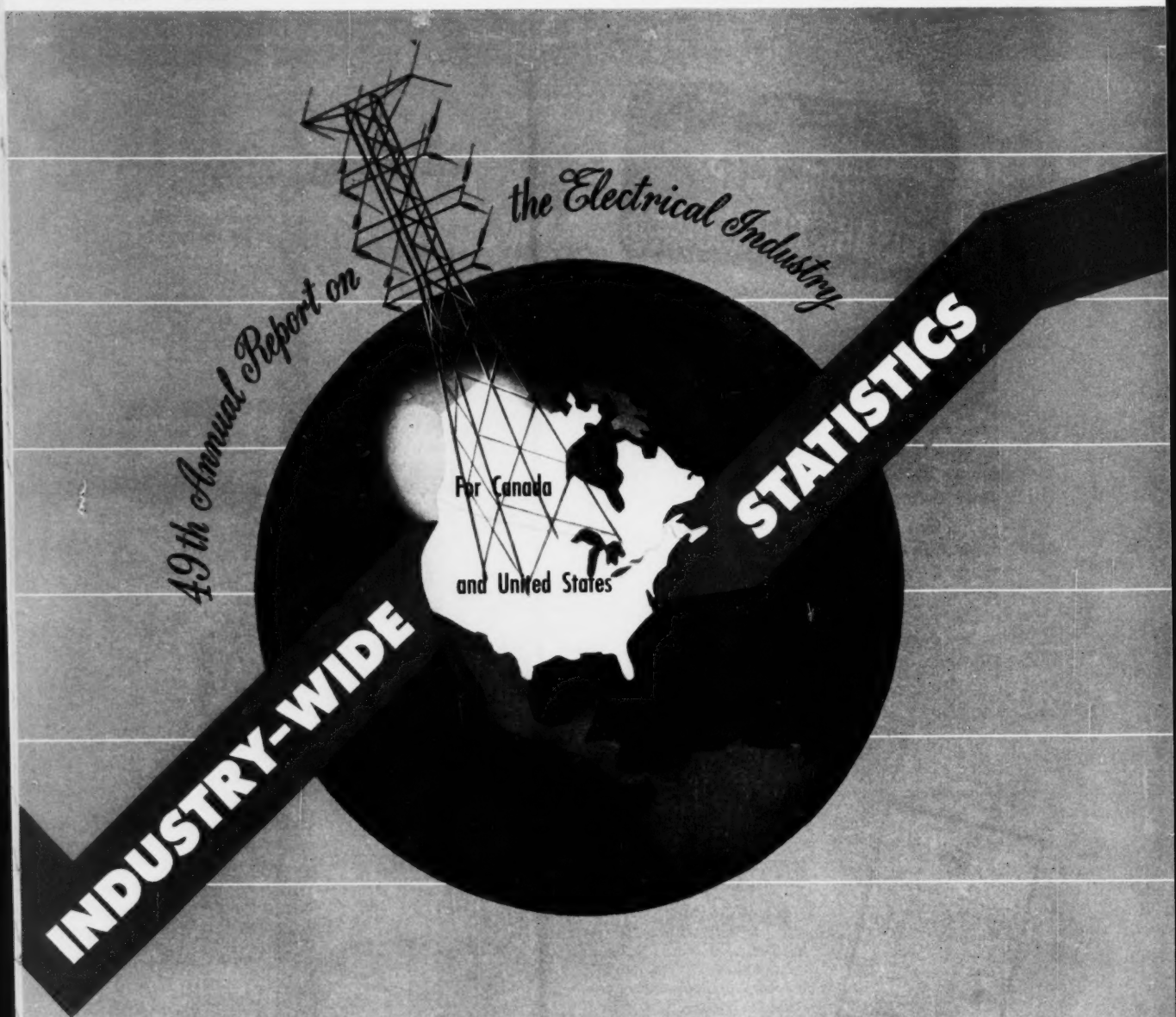
JANUARY 26, 1953

Electrical World

Price One Dollar

A McGRAW-HILL PUBLICATION



Power Companies • Federal Agencies • State and Municipal Systems
Electric Co-ops • Non-Utility Power Plants • Trends in Electrical Manufacturing

20 New Stocking Points —

SPEED DELIVERY OF 5/8% STEP VOLTAGE REGULATORS

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5/8% STEP VOLTAGE REGULATORS

Now Allis-Chalmers power and distribution regulators are stocked in 20 convenient stocking points across the country. You can solve voltage problems faster than ever before. You can eliminate complaints due to low voltage at once. Best of all, you can start profit curves rising as soon as investigation shows that low voltage is the cause.

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Allis-Chalmers 5/8% step voltage regulators have proved their economy and reliability in over twenty years of operation.

Call your nearest Allis-Chalmers district office for the complete story or write Allis-Chalmers, Milwaukee 1, Wisconsin.

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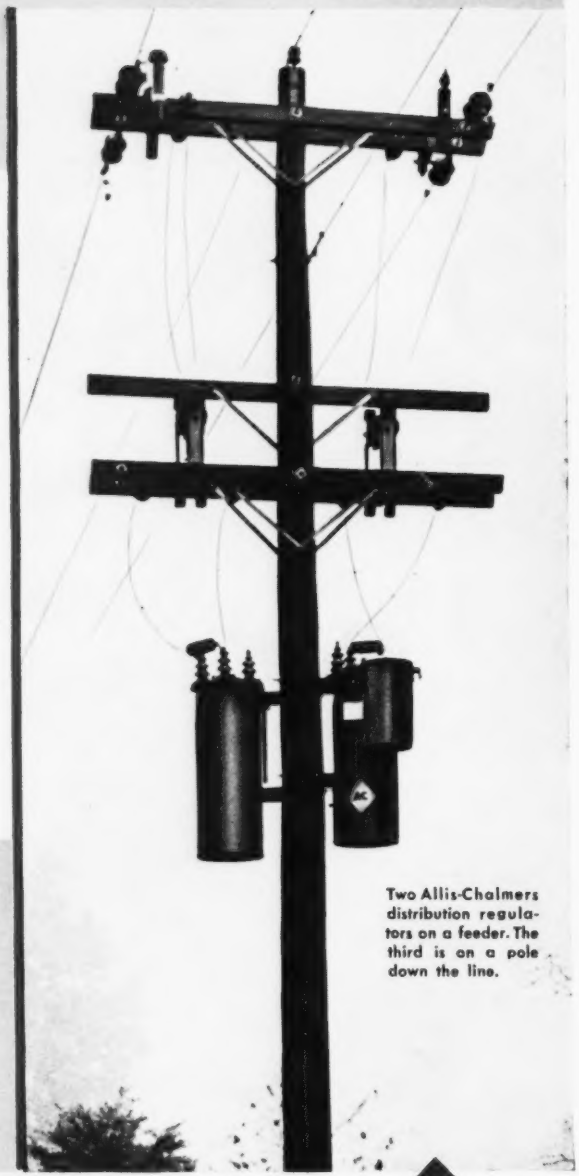
Maintenance Stickers

You can keep a handy, on-the-spot record of control settings with these adhesive-backed stickers. They provide a convenient service record for all types of regulators. Write on them either with pen or pencil.



Two Allis-Chalmers distribution regulators on a feeder. The third is on a pole down the line.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Originators of 5/8% Step Regulation

More Statistics Added

For 48 years EW has been publishing an annual statistical issue. In this, our 49th attempt, we have added some information which we think will be of interest to the industry. Here are examples:

Territorial Data . . . Alaska and Hawaii, which are being considered for statehood, and Puerto Rico are assuming greater importance in the American scene. Since most of their equipment is purchased from American manufacturers, a special section is devoted to their construction expenditures and capacity additions.

More on Power Lines . . . Information on primary distribution is included for the first time. Recently Edison Electric Institute thoroughly revised its census of transmission lines in miles and voltages. Results are in the Transmission and Distribution section.

Rates . . . Everybody knows rates are going up. This year EW summarizes the increases by regions.

Fuel Costs . . . Even fuels of the same type differ in Btu-content. This makes comparison of fuel costs difficult. So EEI solved this problem by analyzing cost of various fuels figured in terms of Btu's. The job is done by regions.

Industrial Power Plants . . . The Industry section gives the statistics on non-utility plant capacity and production. Also included is use of power by manufacturers.

Canadian Data . . . Canada is expanding its power systems. So there's a page on Canadian statistics.

We Got Lots of Help . . . Getting these new sections and the many old ones together meant a lot of work to our staff. But the credit really should go to the industry. Without the dozen fact-gathering agencies and the hundreds of power suppliers who answered our questionnaire, we could never claim that this is the most complete and accurate Statistical Issue EW has ever published.

Electrical World

Published for 79 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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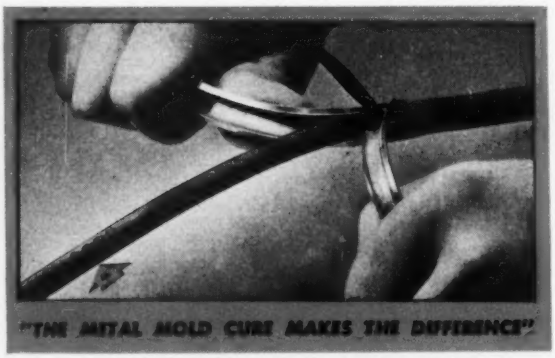
Fewer replacements ... less time lost ... lower operating costs—that's what using Hazacord means to you. Regardless of the treatment it gets, mold-cured Hazacord has the "built-in" ability to absorb more punishment and stay on the job longer—that's why it's preferred for economical service on rugged industrial jobs everywhere.

Every Hazacord flexible cord and portable cable is protected with Hazard's exclusive Hazaprene ZBF sheath which means extra resistance to such common industrial perils as oils, acids, chemicals, moisture and weather. In addition, the Hazaprene sheath is *cured under pressure in a continuous metal mold*—the best method known to provide extra density, lasting toughness, a smooth, abrasion-resistant surface. And its high flame resistance more than meets the requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines.

There's a Hazacord flexible cord or portable cable for every need. Ask your jobber about Hazacords today. For the complete catalog of Hazacord flexible cords and portable cables EW-420 write to Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

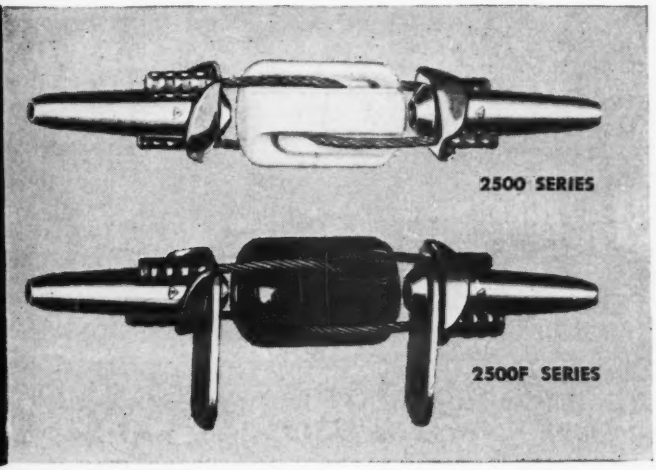


Feel the embossed name Hazacord on the sheath—positive proof of a mold-cured cord. And mold-curing means *extra* long life to portable cords.

HAZARD Insulated wires and cables for every electrical use

for the largest number of line applications at the lowest possible cost...

USE *Electroline* Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

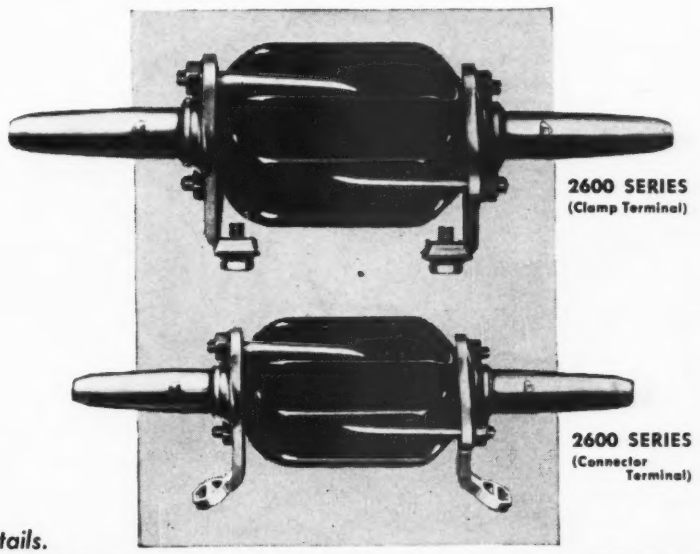
These Insulating Automatic Line Splice Sectionalizers are ideal for:

Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.



Send for Bulletins containing complete details.

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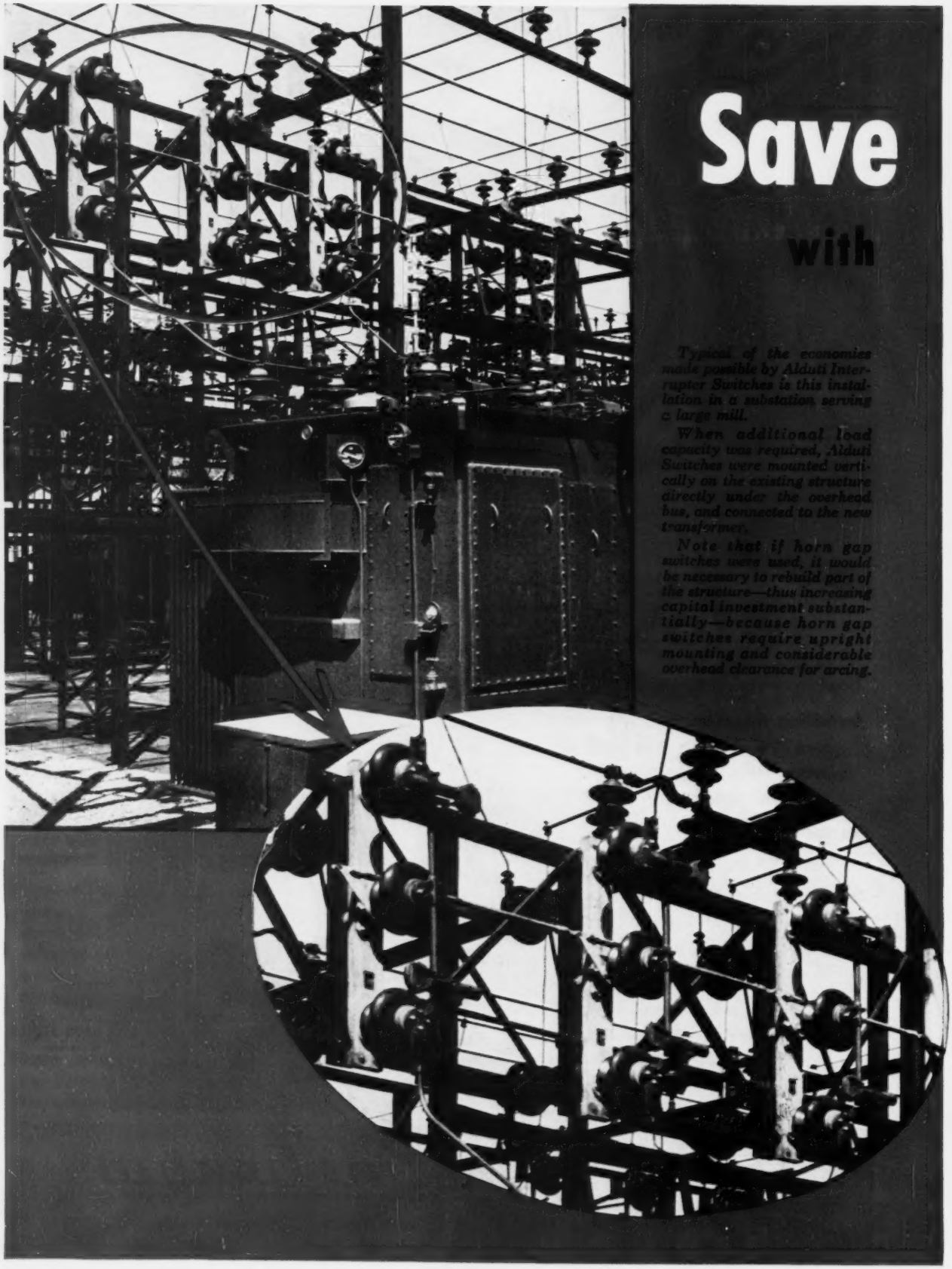

Save

with

Typical of the economies made possible by Alduti Interrupter Switches is this installation in a substation serving a large mill.

When additional load capacity was required, Alduti Switches were mounted vertically on the existing structure directly under the overhead bus, and connected to the new transformer.

Note that if horn gap switches were used, it would be necessary to rebuild part of the structure—thus increasing capital investment substantially—because horn gap switches require upright mounting and considerable overhead clearance for arcing.

Capital Investment

Alduti* Interrupter Switches

They are taking the place of disconnect switches and horn gap switches because of their current interrupting capacity, and because their *confined-arc* operation permits vertical or inverted mounting—saves structure cost.

They are also taking the place of more expensive equipment . . . reducing investment . . . and providing safe, dependable interruption for high-voltage power circuits.

*Alduti is pronounced "All Duty" and signifies the ability of these switches to interrupt magnetizing and charging currents as well as 600-ampere load currents. It also signifies their wide applicability to sectionalizing, preferred-emergency throwover, bus transfer, capacitor bank switching, and to transformer primaries, transformer secondaries, and metal-clad applications such as power centers and unit substations.

ALDUTI INTERRUPTER SWITCHES encourage **NEW THINKING** in system layout, and show **NEW POSSIBILITIES** for versatility in arrangement, and for economy. May we send you this booklet containing **NEW CONCEPTS** of circuit interruption? A note to S&C on your letterhead will bring it.

S&C ELECTRIC COMPANY

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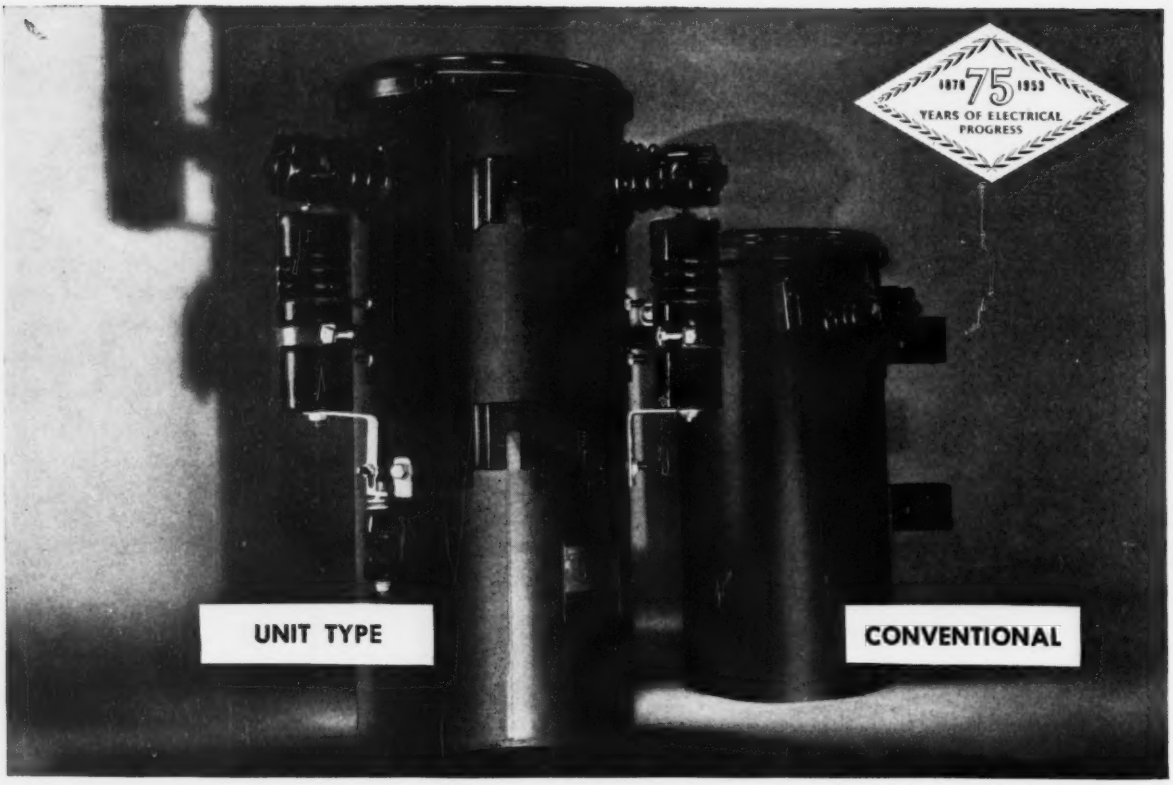
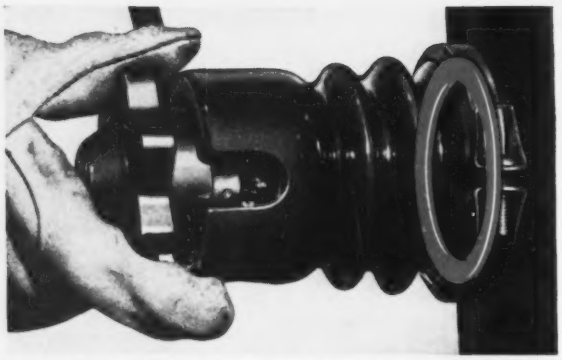
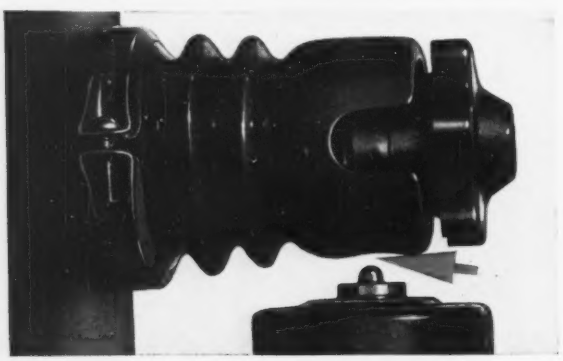
SPECIALISTS IN HIGH-VOLTAGE CIRCUIT INTERRUPTION





NITRILE SEAL (in red) is used on all openings—including bushings—to prevent breathing. An extra feature is non-rustable stainless steel band and Everdur bolt which clamp bushing to tank.



EXTERNAL GAP on G-E unit-type transformer isolates arrester from high-voltage lead. The gap keeps arrester at ground potential and prevents line grounding in event of arrester damage.

Easier to Connect Better Protected

New tank-wall high-voltage bushings on General Electric transformers—both conventional and unit type—make them easier to install. They permit faster, safer connections—without tools. Cable can be brought in from either side of the bushings, tightened quickly.

EXTERNAL GAP PROTECTS. On G-E unit-type transformers, the Pellet arrester is externally gapped to the new tank-wall bushing. This gap keeps the arrester at ground potential and prevents line grounding in case of arrester damage. And because the Pellet arrester is of the valve type which can't be eroded by discharge, it offers protection that lasts indefinitely. It can be installed anywhere on your system regardless of short-circuit currents.

Many ratings of these Spirakore* transformers with tank-wall high-voltage bushings can be shipped directly from one of G.E.'s warehouses near your locality. They're available in ratings 5 kv and below, 100 kva and below. For more information get in touch with your nearest General Electric representative. General Electric Company, Schenectady 5, New York. 431-2

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GENERAL ELECTRIC

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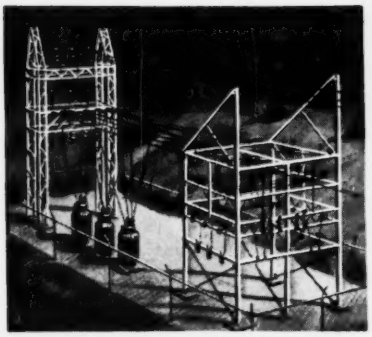
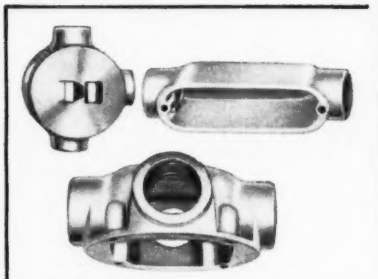
Electrical Applications of Aluminum

Savings in Substations



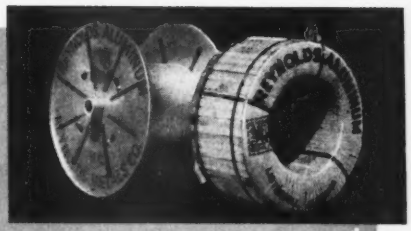
Important savings in erection costs and maintenance are prime reasons for the growing popularity of aluminum substations with utility companies, co-ops and large industrial users. The light weight and easy fabrication of aluminum permits faster, simpler erection. More shop assembled aluminum components mean less assembly at the job site—less skill is needed in assembly and anywhere from 3 to 7 days can be cut in erecting an average substation. No massive foundations are needed, grounding requirements are much simpler and field drilling is easier—more-savings thanks to aluminum. Substation maintenance costs are kept to a minimum because aluminum requires no painting—no costly shut-downs.

Efficient Electrical Fittings and Fixtures



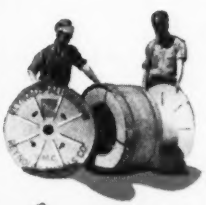
Many thousands of different types, sizes and shapes of die-cast aluminum electrical fittings and fixtures are in wide use today. One important reason for this popularity of aluminum is its weight. Aluminum fittings are light, easy to handle and costs less to ship and deliver to the job... yet are strong enough to withstand shock and strain far beyond actual job requirements. Aluminum is also rustproof and weatherproof and is highly resistant to chemical corrosion. The smooth satin finish inside and out of aluminum fittings protects fingers during installation and protects insulation on wire. Perfect uniformity in die-cast fittings and fixtures is easily obtained which makes installation easier, cuts costs and speeds up work. Write to Reynolds for details on these and any other electrical aluminum applications.

Cut Conductor Handling Costs



WITH REYNOLDS ACSR MASTER REEL and COIL

Want cost reduction proof? Then see how Reynolds Master Reel and Cable save important time, money and labor.



Reynolds all metal Master Reels sharply decrease handling, storage and bookkeeping costs. *Four Master Reels actually take the place of one hundred wooden reels!* They're easily taken apart and re-assembled around the Master Coil by linemen in the field. They're far stronger than wooden reels and can be used over and over again.

Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. They are carefully waterproofed, lagged and banded for complete protection in transit and on the job.

Plan today to convert to the money-saving Reynolds Master Reel and Coil method. Sooner or later you'll use aluminum—why not now? *Reynolds Metals Company, 2584 South Third Street, Louisville 1, Ky.*

FREE... ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

For Complete Information

see your Reynolds distributors listed below or write direct to
Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.

Westinghouse Electric Supply Co., New York, N. Y. (And branches) • North Coast Electric Co., Seattle, Wash. Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

There's a *Low Cost* Westinghouse Demand Meter...

- **for every circuit**
- **for every rate**
- **for every mounting!**

Here are the answers to all your needs for less costly metering of kw and kva demand. It's a *complete* line of Westinghouse Demand Meters, engineered specifically to shave your specialized metering costs. In every case the designs are . . .

Simple . . . only a minimum number of moving parts. Block Interval types are used with standard Westinghouse Meters. Thermal demand elements are combined with conventional watthour meters.

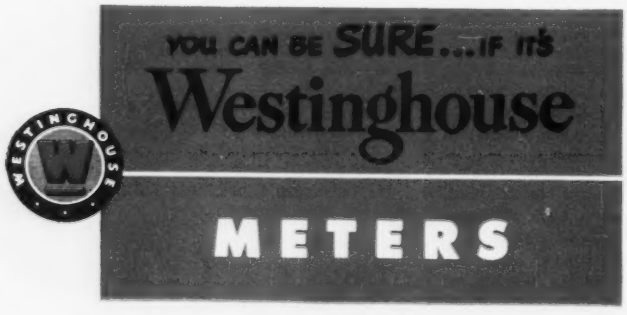
Compact . . . no larger than a 3-element watthour meter except for increased depth.

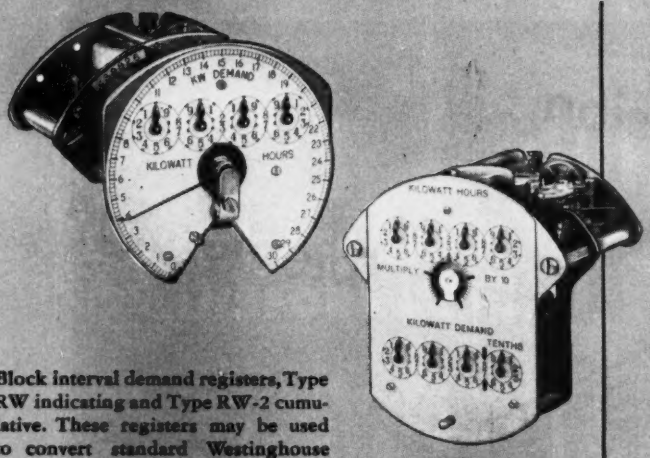
Easy to install . . . just one mounting for both watthour and demand meter . . . connections are interchangeable with standard watthour meters.

Easy to maintain . . . in all units you'll find the same low maintenance characteristics you enjoy in Westinghouse Standard Watthour Meters.

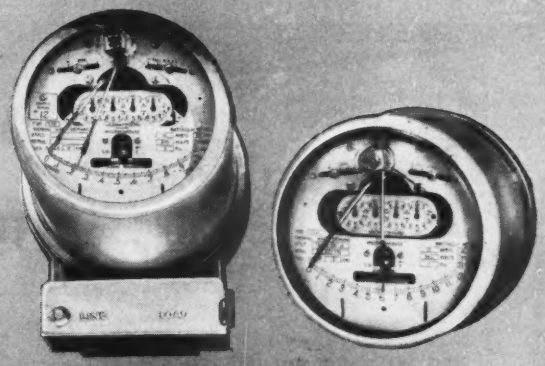
Specific examples of Westinghouse pioneering in pace with your needs include: the first polyphase, combination thermal unit in a socket base; the first and only combination polyphase watthour and thermal kva demand meter.

It is the kind of skillful, pace-setting engineering that stands behind every meter that Westinghouse builds today. It's another good reason to always specify . . . Westinghouse. J-40425



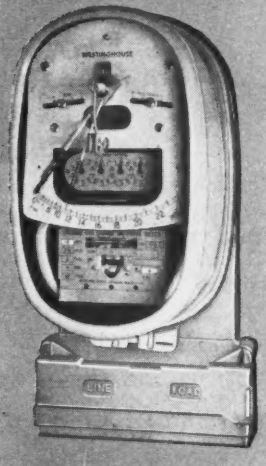


Block interval demand registers, Type RW indicating and Type RW-2 cumulative. These registers may be used to convert standard Westinghouse Watthour Meters to demand types.



CAH and CSH single-phase, combination watthour and thermal demand meters. In the Type CSH a 50-ampere meter with 48-kw (200-amp) full-scale rating is available.

CSH and CAH polyphase, combination watthour and thermal demand meters. CSH-8 is the first polyphase meter available for socket mounting.



KCA polyphase, combination watthour and thermal kva demand meters . . . available for all services under all conditions of current, voltage and power factor.

QCS and QCA single or polyphase, combination watthour and thermal ampere demand meters . . . available in all standard ratings.

GET COMPLETE INFORMATION...

Complete details, including operating and construction features, application information and wiring diagrams, are contained in individual catalogs covering each of the meters shown here. Ask your Westinghouse representative for copies or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

Type RW (Indicating) Demand Registers . . . C.S. 42-315

Type RW-2 (Cumulative) Demand Registers . . C.S. 42-316

Type CSH and CAH (single-phase) Combination kw Demand . . . . . C.S. 42-337

Type CSH and CAH (Polyphase) Combination kw Demand . . . . . C.S. 42-338

Type KCA Combination kva Demand . . . C.S. 42-340

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ALLIS-CHALMERS

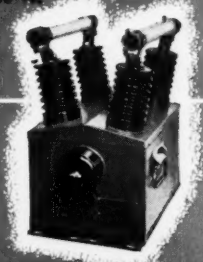
INSTRUMENT TRANSFORMERS

no leaks or contamination

with this Vacuum-Pressure Process

No Leakage or Contamination for the outdoor current transformer, Type KO, rated up to 15 kv and 800 amperes.

High Dielectric Strength for outdoor potential transformer, Type PWD, rated up to 15 kv, 200 va.



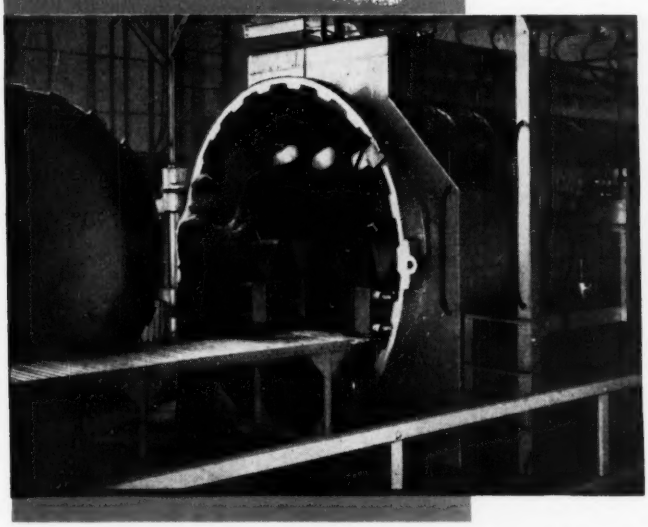
Cuts Maintenance on indoor potential transformer, Type PD, rated up to 14,400 volts, 200 va, fused or unfused.

Allis-Chalmers Vacuum-Pressure System for Compound Filling Instrument Transformers Boosts Safety Factor and Virtually Eliminates Maintenance.

HERE'S AN ALLIS-CHALMERS "extra" that can save you money every day and add years of service to your instrument transformer.

It's the modern A-C vacuum-pressure solid-compound process. In addition to locking out air and moisture, it practically does away with transformer maintenance.

Shown below, the vacuum-pressure chamber does two "life-prolonging" jobs: (1) It leaves the core and coil assemblies bone dry, as a combination of vacuum and heat remove moisture and entrapped air. (2) While under vacuum it fills all voids with compound. This draws hot compound into the innermost parts of the assembly, preventing local ionization and extending normal insulation life.



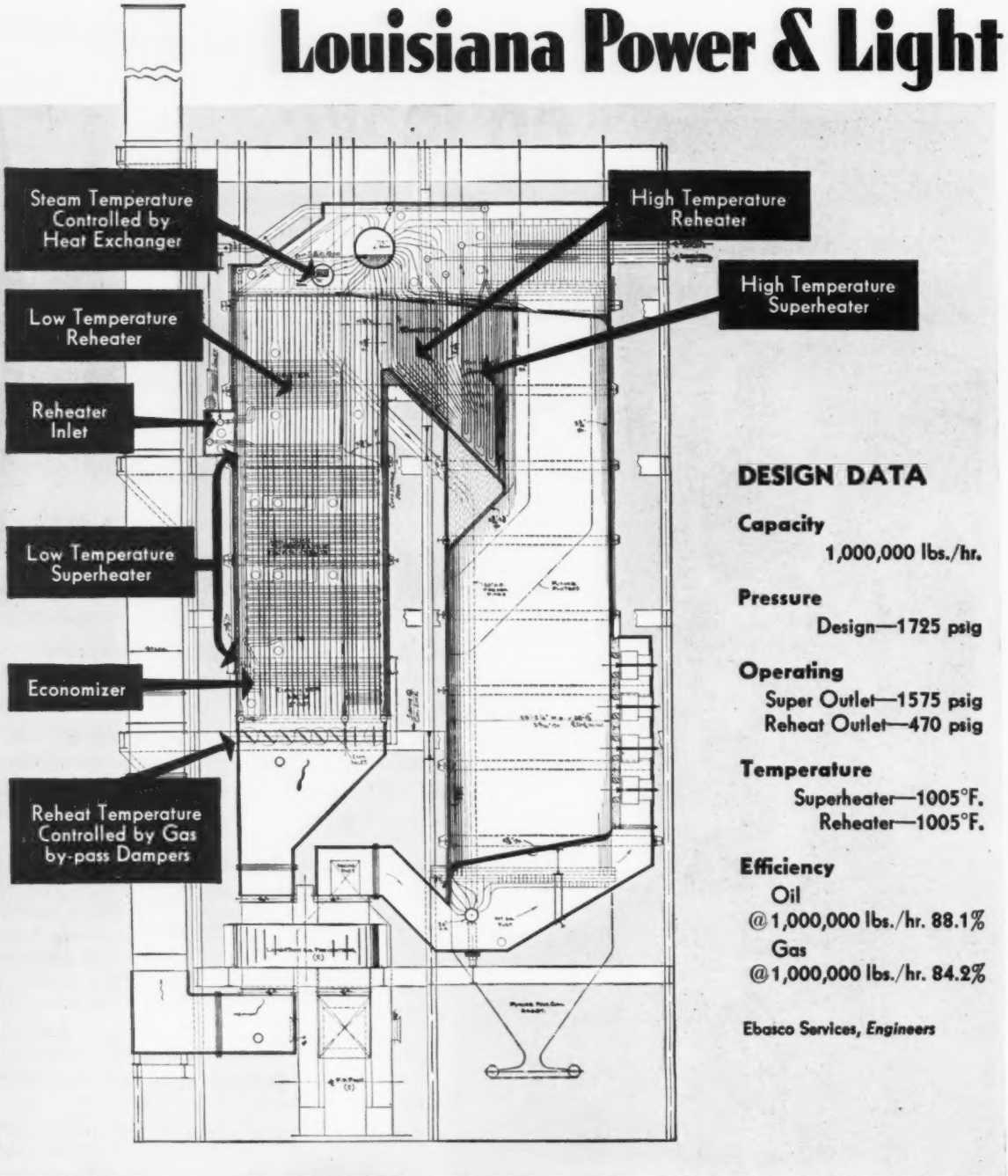
Solid compound used in the process is chemically stable, has high dielectric strength and is completely free of absorbed gases and impurities. It stops leakage and contamination.

You'll find Allis-Chalmers vacuum-pressure compound-filled units are a sound investment in accuracy and economy. As thousands of users find, they eliminate testing and filtering oil and greatly reduce periodic inspection.

It's easy to see how the benefits of compound-impregnating process will save you money, can save you trouble. Why not contact your nearby A-C district office for more information today. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3833

ALLIS-CHALMERS

Louisiana Power & Light



DESIGN DATA

Capacity
1,000,000 lbs./hr.

Pressure
Design—1725 psig

Operating
Super Outlet—1575 psig
Reheat Outlet—470 psig

Temperature
Superheater—1005°F.
Reheater—1005°F.

Efficiency
Oil
@1,000,000 lbs./hr. 88.1%
Gas
@1,000,000 lbs./hr. 84.2%

Ebasco Services, *Engineers*

TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston · New York · Philadelphia · Washington · Buffalo · Pittsburgh · Cleveland · Detroit · Chicago
Cincinnati · Charlotte · Atlanta · New Orleans · St. Louis · Kansas City · St. Paul · Tulsa · Houston
Denver · Salt Lake City · Los Angeles · Portland · Seattle

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS

first to use Reheat with Natural Gas

Louisiana Power & Light Company's 1,000,000 lbs./hr. pressure furnace Riley Reheat Unit will be the first reheat unit fired by natural gas and oil to be installed by the Public Utility industry.

Several features of Riley Unit for Louisiana Power & Light Company

Separate Independent Control of Superheater and Reheater Temperatures.

Maintenance of desired superheater and reheater steam temperatures is obtained by different and independent controls so that an adjustment to the temperature of one does not effect the final temperature of the other. Reheater temperature is controlled by varying the quantity of gas passing over the low temperature reheater sections by means of dampers beyond the economizer. Superheater temperature is controlled by means of a heat exchanger which regulates the temperature of steam entering the high temperature superheater section so as to give the desired superheater outlet temperature over the desired load range.

All Tubes Welded to Stub Tubes. *No Rolled Joints.*

All tube connections to drums and headers of boiler, water walls, superheater and economizer are welded, not rolled and merely seal welded. Stub tubes are shop welded into drums and headers prior to shipment for field weld of tubes thereto.

Furnace Pressurized. *No Induced Draft Fans.*

The unit is a pressurized furnace unit operating with forced draft fans only. The furnace will operate under a pressure of approximately 7.25″ of water. The use of a pressurized furnace reduces over-all fan power requirements and increases efficiency because of lower excess air.

A Few Recent Riley Units for Public Utility Plants

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES, CALIFORNIA
1,200,000 lbs./hr. 2075 psig, 1000°F. and 1000°F. reheat.

LOUISIANA POWER & LIGHT CO.
1,000,000 lbs./hr. 1725 psig, 1005°F. and 1005°F. reheat.
Ebasco Services, *Engineers*

HOUSTON LIGHTING & POWER CO.
1,200,000 lbs./hr. 1700 psig, 1005°F.
Ebasco Services, *Engineers*

SOUTHWESTERN GAS & ELECTRIC CO.
630,000 lbs./hr. 1050 psig, 1005°F.
Sargent & Lundy, *Engineers*

MONONGAHELA POWER CO.
700,000 lbs./hr. 1050 psig, 905°F.
Sanderson & Porter, *Engineers*

UTAH POWER & LIGHT CO.
575,000 lbs./hr. 1700 psig, 1000°F. and 1000°F. reheat.
Bechtel Corp., *Engineers*

CENTRAL ILLINOIS LIGHT CO.
600,000 lbs./hr. 950 psig, 900°F.
Commonwealth Services, *Engineers*

NORTHERN STATES POWER CO.
385,000 lbs./hr. 1500 psig, 950°F.
Pioneer Service & Engineering, *Engineer*

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
460,000 lbs./hr. 1025 psig, 900°F.
Ford, Bacon & Davis, *Engineers*

THE POTOMAC EDISON CO.
700,000 lbs./hr. 1050 psig, 905°F.
Sanderson & Porter, *Engineers*

IOWA ELECTRIC LIGHT & POWER CO.
300,000 lbs./hr. 975 psig, 910°F.

GULF POWER CO.
325,000 lbs./hr. 1000 psig, 900°F.
Southern Services, *Engineers*

SOUTH CAROLINA GAS & ELECTRIC CO.
400,000 lbs./hr. 1475 psig, 955°F.
Gilbert Associates, *Engineers*

UTAH POWER & LIGHT CO.
620,000 lbs./hr. 1500 psig, 955°F.
Bechtel Corp., *Engineers*

IOWA-ILLINOIS GAS & ELECTRIC CO.
250,000 lbs./hr. 975 psig, 905°F.

PUBLIC SERVICE CO. OF INDIANA
400,000 lbs./hr. 1000 psig, 910°F.
Sargent & Lundy, *Engineers*

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

It's just good business to pay a few dollars more and get extra years of service in return. That's why it's good business to specify Gould Planté. The per annum cost of these pure lead batteries is less than any other battery on the market! With the Gould Plus-Performance Plan to help, you'll get truly amazing service life from these "Aristocrats of Stationary Batteries." Write Gould Battery Information Headquarters for full details.

The Gould Planté—
America's Finest
Stationary Battery!

GOULD *Industrial Batteries*

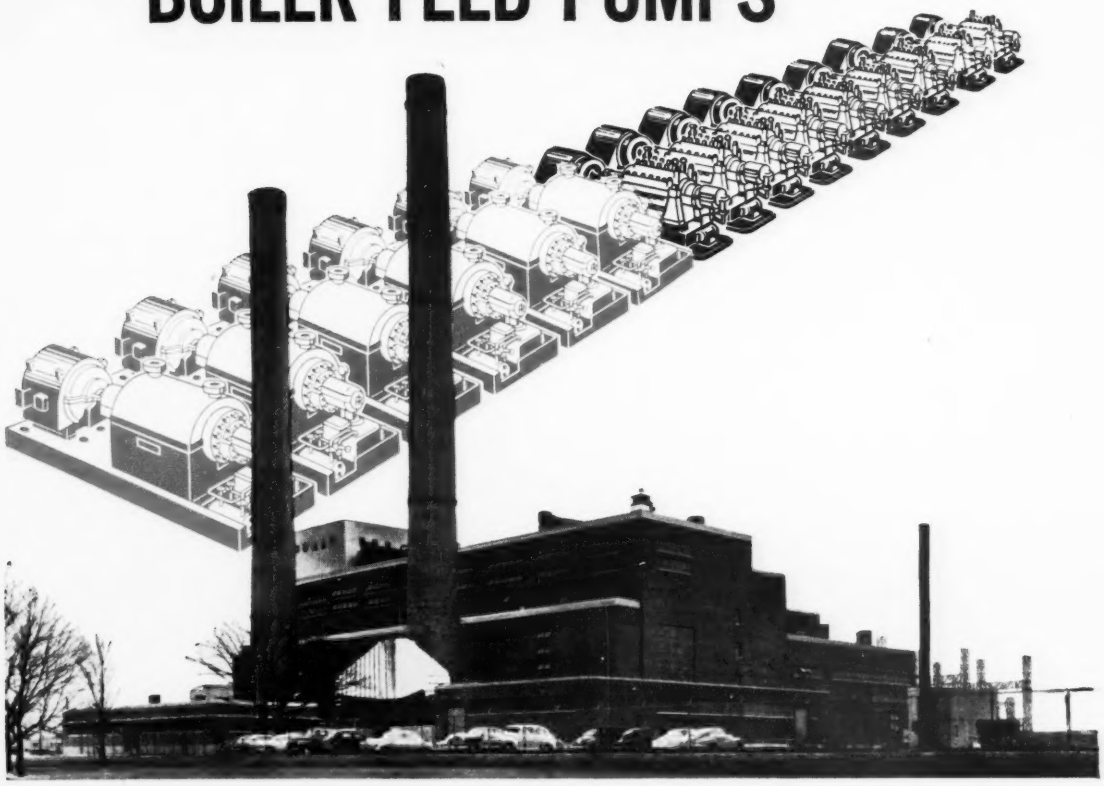
GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

WHITE RIVER STATION ADDING

SIX MORE I-R

BOILER FEED PUMPS



Six 9-Stage CHTA high pressure pumps will serve two new 68,000 kw units at this fast-growing station of Indianapolis Power & Light Company

INGERSOLL-RAND is proud to have been associated in every phase of the development of the new White River station. At this modern plant, the three 45,000 kw units already in operation are served by nine I-R Class HMT, 8-stage boiler feed pumps.

To keep plant capability abreast of increasing load demands, two new 68,000 kw units are now being added. Unit No. 4 is to be put into service in December 1952 and No. 5 a year later. Six 9-stage, 4-inch Class CHTA "double case" pumps will serve these units—driven by 900 hp motors and delivering 708 gpm of 303° feed water at 1565 psi.

Other I-R pumps at White River include vertical circulating and condensate pumps for the five I-R rectangular condensers, evaporator and chlorinator feed pumps and a host of general service units. This installation is another example of the wide variety of pumps offered to the power generating industry by Ingersoll-Rand. Your nearest I-R branch office will be glad to consult with you on your pumping problems.

Ingersoll-Rand

CAMERON PUMP DIVISION
11 Broadway, New York 4, N.Y.

663-10

PUMPS • COMPRESSORS • CONDENSERS • AIR & ELECTRIC TOOLS • ROCK DRILLS • GAS & DIESEL ENGINES • TURBO-BLOWERS

PERMANENT PROTECTION FOR

ARE INSULATED AND PROTECTED *with*

NATVAR 400

EXTRUDED PLASTIC TUBING

The KLIXON C6360 is a current type relay which means that the entire motor current flows through it. Therefore the wire in the coil winding is heavy enough to be used for leads, eliminating screw terminals. And since sleeves of Natvar 400 are reasonably low in cost, and are easily slid over the leads, assembly is quicker and less expensive. Also, leads can be color coded, because Natvar 400 is furnished in bright, distinctive colors.

KLIXON Protective devices and controls, manufactured by Spencer Thermostat Division of Metals & Controls Corporation, are used by foremost makers of refrigerating and other electrical equipment to assure safe, continuous operation under all service conditions.

Since reliability of KLIXON devices is essential, only the best materials are used. Natvar 400 extruded plastic tubing has been selected as the most suitable lead insulation for the starting relay shown above because of its excellent physical and electrical properties and its dependable uniformity.

Natvar 400 and other Natvar flexible insulating materials are available either from your wholesalers stock or direct from our own.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

Ask for Catalog No. 22

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

PERMANENT PROTECTION FOR POWER PACKAGES

Crystal Valves Give Unlimited Surge Capacity At All Ratings

A leading manufacturer equips this transformer package with Crystal Valve Ventilated Gap Arresters for unlimited protection of distribution circuits. Its engineers know that Crystal Valve Arresters withstand repeated surges, are not harmed by discharge, can be installed on all types of circuits without regard to system capacity.

Like power companies across the nation, this manufacturer relies on the proved performance of thousands of Crystal Valve Ventilated Gap Arresters with a service record almost 100% perfect. Other advantages include easy inspection of high-speed multiple spark gap assembly . . . ventilation to keep housing dry . . . true valve action for fast suppression of follow current . . . no measurable deterioration after years of service. Easily installed where space is limited . . . no need to carry large stock of different ratings.

Insist on Crystal Valve Arresters on your next transformer package, for permanent, trouble-free protection.

Send today for latest technical data on Crystal Valve Arresters and their installation. Ask for CV Catalog.

CRYSTAL VALVE
LIGHTNING ARRESTERS
ELECTRIC SERVICE MANUFACTURING CO., PHILADELPHIA 32, PA.

DIAMOND JUBILEE of Doctor De Laval's Great Idea!

In 1878, a young Swedish engineer named Carl Gustaf De Laval conceived the design of the first practical centrifugal separator. He invented it in order to remove cream from milk continuously.

Later, De Laval centrifuges were applied in the power and transmission fields. If cream could be separated from milk, why not water from oil? The De Laval Insulating Oil Purifier was developed, and for thirty years this machine has remained the safest, most foolproof way to remove every bit of moisture from transformer and circuit-breaker oil.

Once water is thrown out of the oil by centrifugal force, it is discharged continuously to waste. It cannot recontaminate the oil. In a single pass through a De Laval machine, oil is completely restored to a safely high dielectric in the most economical and foolproof manner.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL
INSULATING OIL PURIFIERS

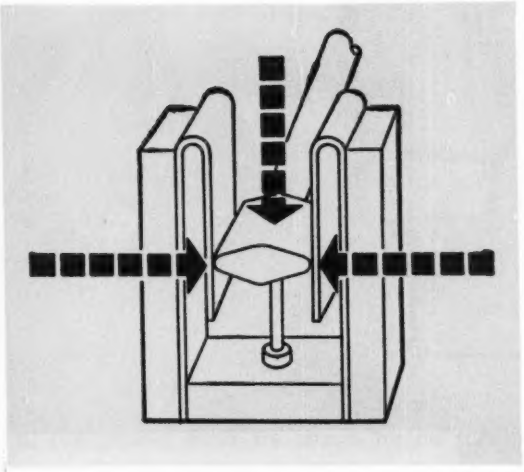
ELECTRIC SERVICE MANUFACTURING CO., PHILADELPHIA 32, PA.

AMPLITACT

TRADE MARK

a revolutionary concept

of air break switch contacts



The "AMPLITACT" design principle is such that resultant electromagnetic forces induced by current flowing through the contact . . .

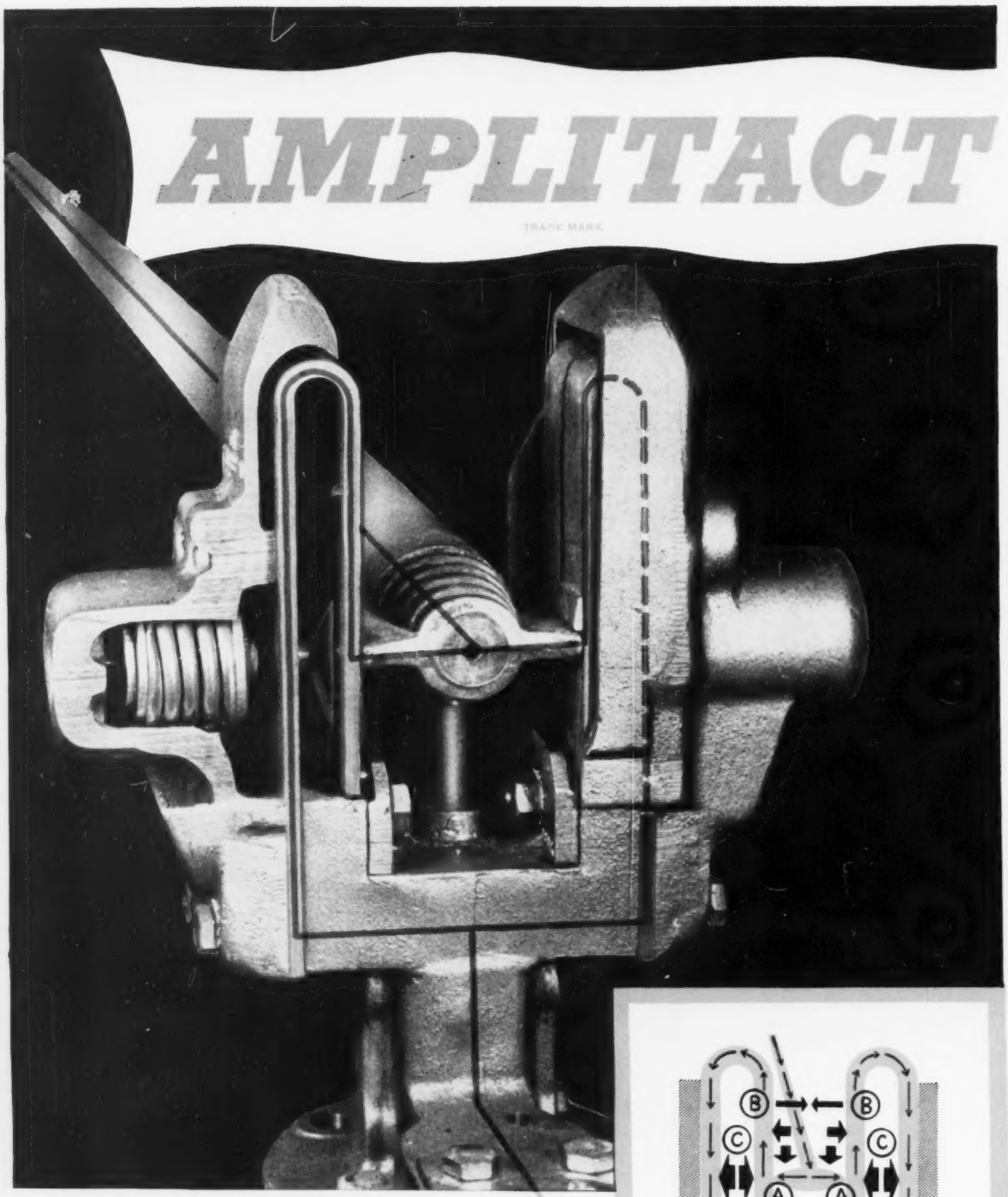
1. Greatly increase contact pressure
2. Force the blade firmly into the engaged position.

Southern States Equipment Corp.

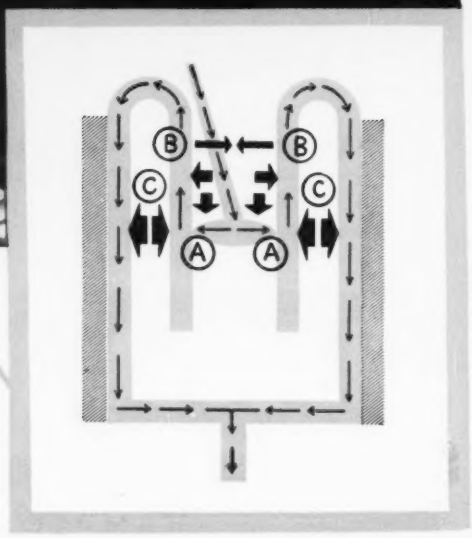
HAMPTON GEORGIA

AMPLITACT

TRADE MARK



PATENT APPLIED FOR



HERE is a cutaway view of the AMPLITACT with current path shown in orange. Field tests have dramatically proved the effectiveness of this contact.

a revolutionary concept of air break switch contacts

Now for the first time in high pressure air break switch contact construction, the magnetic fields surrounding current carrying members are utilized to effect higher contact pressure. With this design, any increase in current flowing through the contact is reflected in a proportional increase in contact pressure and in forces which hold the blade in the closed position.

What does this mean to switch performance on today's circuits?

It means that a switch equipped with the AMPLITACT can keep pace with increasing system short circuit capacities. When the magnitude of the current increases, the AMPLITACT responds with increased contact pressure assuring maximum dependability of switch performance.

The AMPLITACT is an exclusive Southern States feature.

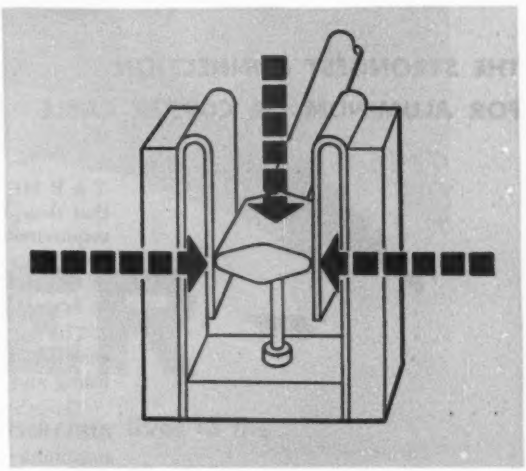
Here is the AMPLITACT . . .

The schematic drawing traces current through the AMPLITACT. Inner segments of loop are resilient and outer segments are fixed against rigid abutments.

A. Current flowing through blade changes direction 90° when current interchange is made at junction of blade tip and resilient contact. Resultant forces from these changes in current direction hold the blade in the closed position.

B. Two parallel paths are formed for the current in the two resilient segments. Since the current is flowing in the same direction, these conductors tend to attract . . . thus increasing contact pressure.

C. Two parallel paths are also formed by the fixed and resilient segments. However, in this case the current is flowing in opposite directions in conductors in close proximity. The result is a powerful force from opposing magnetic fields which amplifies contact pressure in proportion to the square of the current flowing through the loops.

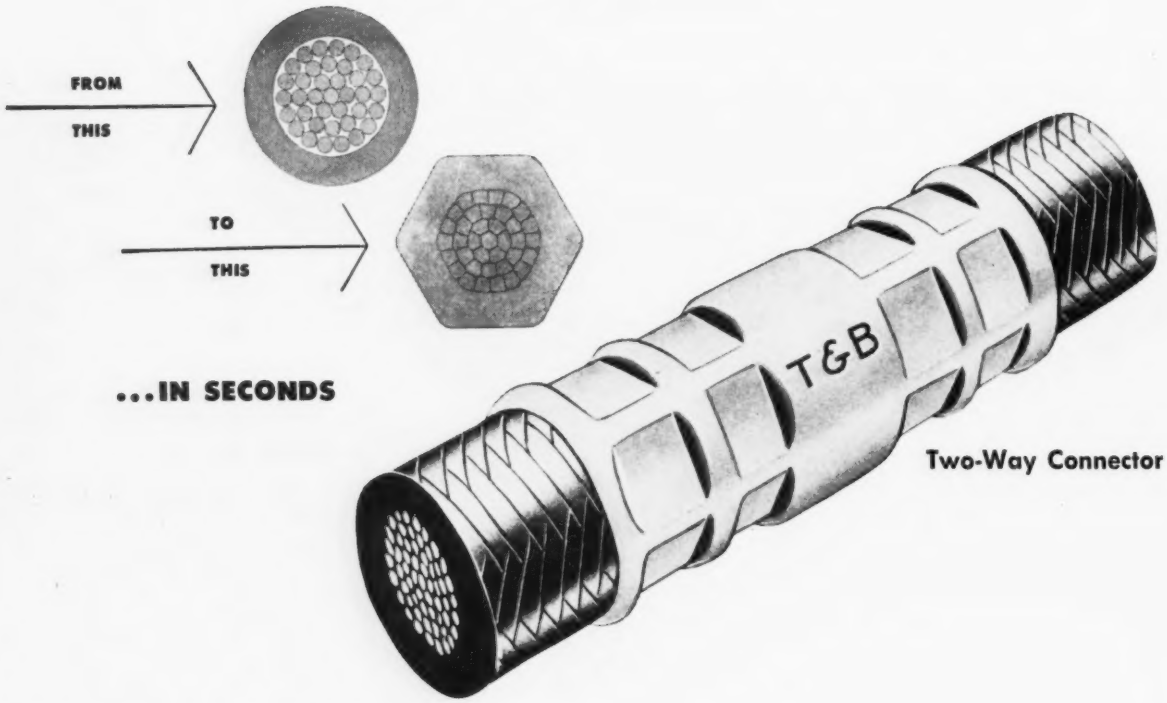


The AMPLITACT design principle is such that resultant electromagnetic forces induced by current flowing through the contacts . . .

1. Greatly increase contact pressure
2. Force the blade firmly in the engaged position.

Southern States Equipment Corp.
HAMPTON, GEORGIA

T & B METHOD



THE STRONGEST CONNECTION FOR ALUMINUM OR COPPER CABLE

T & B METHOD two-way connectors form exceptionally tight butt splices that develop tensile strengths far in excess of National Electric Code requirements. Uniform all-around compression of T & B METHOD two-way connectors assures maximum contact and minimum current loss. A slight taper at the compression end of the fitting helps prevent damage to strands due to flexing and vibration.

The hardened steel dies of a light-weight, portable T & B hydraulic tool compress around the joint with tremendous hexagonal pressures and force the fitting and cable into one homogeneous mass . . . all in a few seconds.

Though the use of an oxide-inhibiting agent is recommended for T & B METHOD *aluminum* connections, no joint compounds are needed to obtain maximum electrical efficiency. For *copper* connections, no special cable treatment is required. T & B METHOD fittings for aluminum have fine serrations inside the barrel which, during compression, penetrate the insulating film of aluminum oxide on the outside cable strands. At the same time, the oxide film on the inner cable strands is effectively abraded, thereby maintaining a dense, tight joint of high conductivity.

Investigate the complete line of T & B fittings for aluminum and copper cable – they offer you savings in time and installation costs. Write for your free copy of T & B Bulletin #67.

LOOK FOR THIS SIGN – T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T31

THE THOMAS & BETTS CO.

INCORPORATED

14 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

PIONEERING *in Hydraulic* POWER –

The Pioneers - those who devoted their lives to the harnessing of one of nature's mightiest forces - water - contributed greatly to this nation's progress! For 77 years, we have built turbines for high, medium and low heads, many types of valves, hoists and gates, pumps, trash rack rakes and kindred hydraulic equipment. Put your problem up to us.

S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.

New

★ A completely dependable, automatic operating mechanism for air-break switches, it requires no outside source of power. It draws current from a battery to actuate the solenoids and relays. It uses the instantly available pressure of compressed nitrogen to open and close your switches.

This new mechanism is adaptable to a variety of chores. Use it to sectionalize transmission lines . . . disconnect branch lines . . . transfer loads from one power source to another. Or you can make any variation on these three basic schemes by using standard relays. The current for the relay coils is .6 amperes at 6 volts.

Maintenance of this new mechanism is easy. Routine inspection will tell you when to change gas cylinders. But you can figure on 30 to 40 complete operating cycles before that's necessary. The battery recommended will hold 85% of its charge for a whole year, and will last about ten years.

Let your Joslyn Representative give you the whole story. Call him today or write: Hi-Voltage Equipment Company, 4000 East 116th Street, Cleveland 5, Ohio.

HI-VOLTAGE

Gas-Operated Mechanism

HOW IT WORKS

1-The mechanism is energized for operation by a relay or a pushbutton.

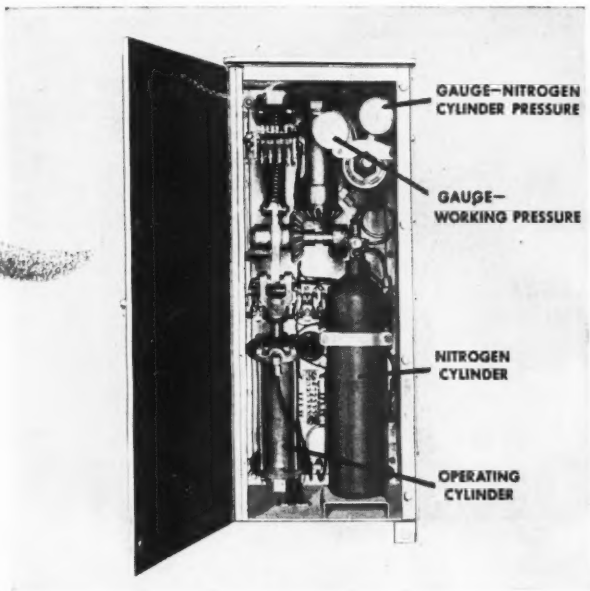
2-Main magnetic valve opens.

3-Either opening or closing valve opens simultaneously with main valve.

4-Gas is admitted at either one end or the other of the operating cylinder. Adjustable needle valves regulate the speed.

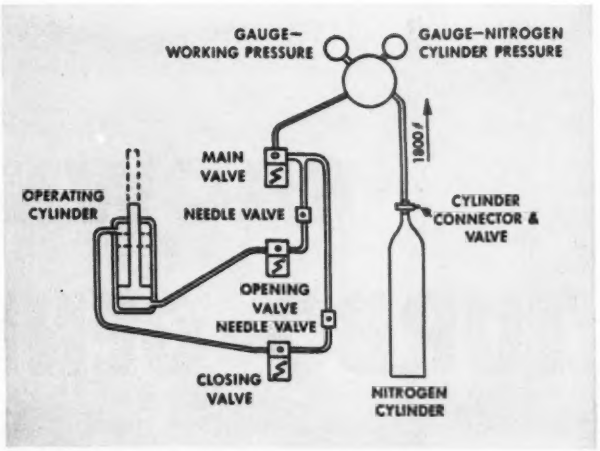
5-Limit switches deenergize valves at end of operation and set circuits for next operation.

Note: For emergency operation, the mechanism may be fitted with a handle for manual control.



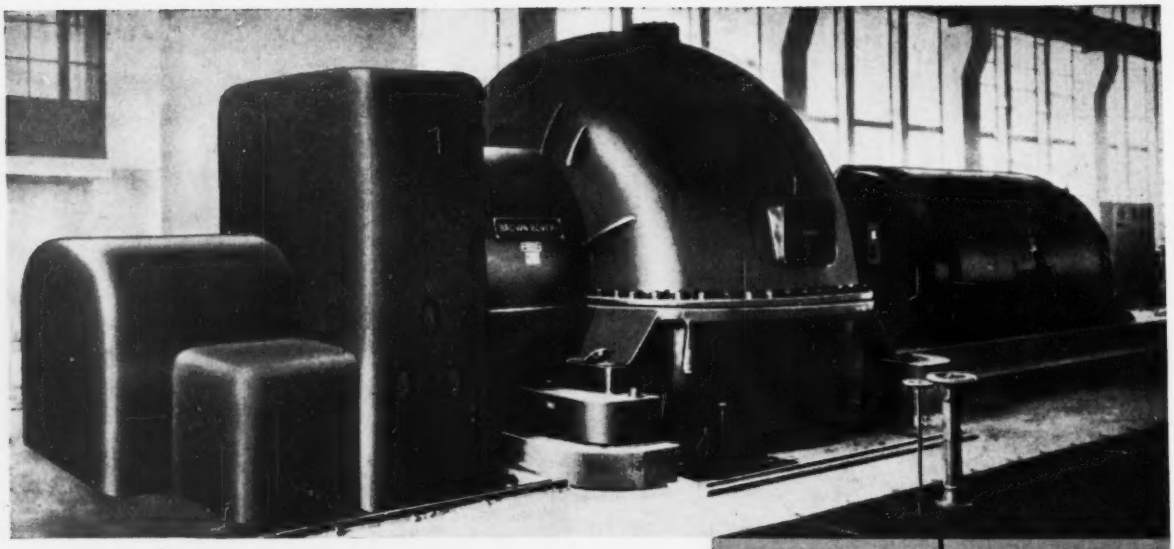
SPECIFICATIONS

- Size: 32" high, 13" wide, 13" deep.
- Two sizes of operating cylinders available to provide 310 or 400 ft-lbs of operating effort.
- Operating time—3 seconds.
- Stainless steel spring holds switch in open or closed position.
- Completely enclosed in a heavy-gauge metal case.



EQUIPMENT COMPANY

4000 EAST 116TH STREET · CLEVELAND 5, OHIO



built on solid ground

		LOW INITIAL COST	TOP EFFICIENCY
		LONG LIFE	MINIMUM MAINTENANCE
BROWN BOVERI QUALITY	PROMPT DELIVERY	COMPACT DESIGN	THOROUGH DEPENDABILITY

BROWN BOVERI TURBO GENERATORS

It will pay you to get the facts.
Write for complete data

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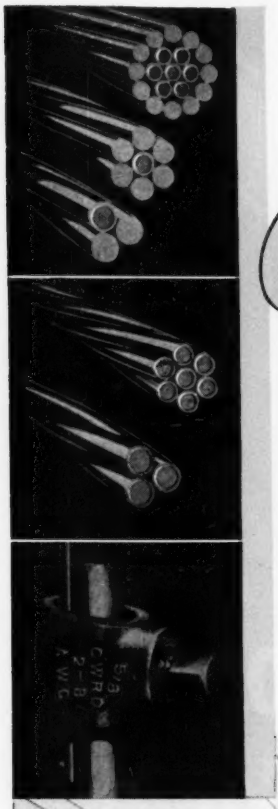


CUT OVERHEAD EXPENSE ON YOUR OVERHEAD LINES WITH Copperweld

TRADE MARK

POWER CONDUCTORS

SHIELD WIRES

GUY AND MESSENGER STRAND

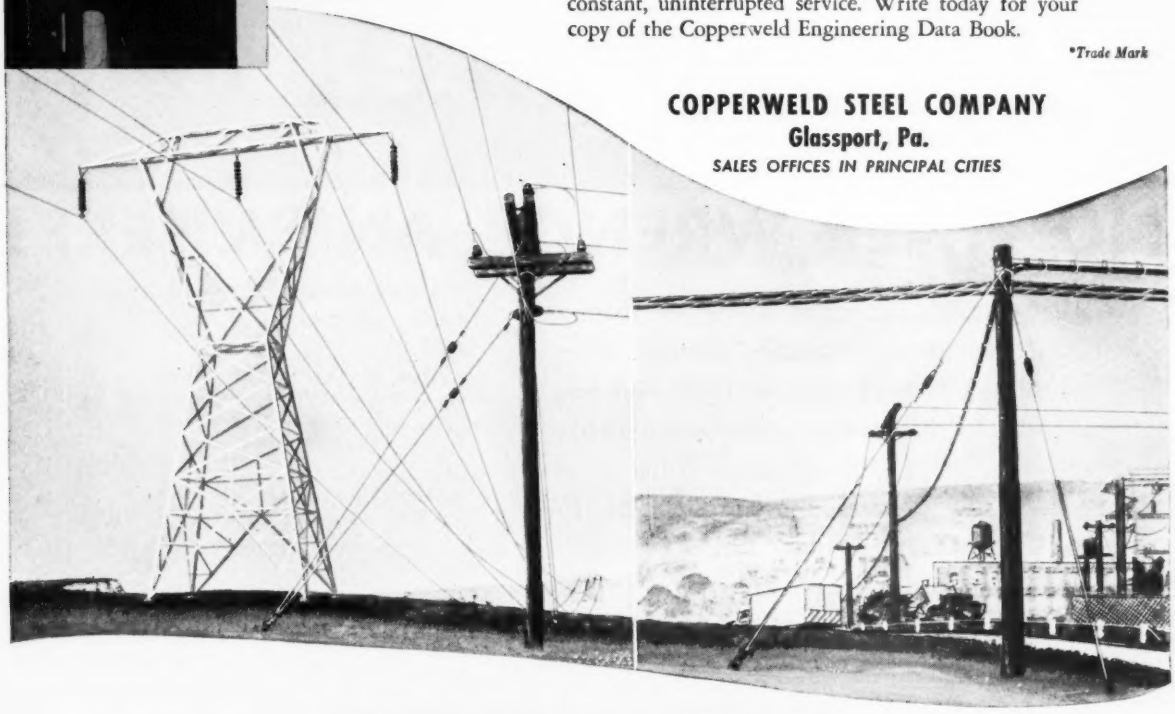
GROUND RODS AND CLAMPS

For over 37 years Copperweld* Products have provided dependable service to the Electrical Industry. Their trouble-free performance has been proved by time. Their lowest annual cost is a matter of record.

When you build with Copperweld Products, you get the long life and conductance of copper inseparably molten-welded to a core of high strength steel. And because Copperweld can't rust, this original high strength is retained for the life of the installation. This means your overhead lines will have the stamina to stand up under all types of operating conditions.

Profit by the experience of many of the world's leading power companies, railroads, and communication systems. Specify Copperweld Conductors, Shield Wires, Strand and Ground Rods for your overhead lines. There is no better way to keep the power load up, keep overhead down and be assured of constant, uninterrupted service. Write today for your copy of the Copperweld Engineering Data Book.

*Trade Mark



COPPERWELD STEEL COMPANY
Glassport, Pa.
SALES OFFICES IN PRINCIPAL CITIES

Copperweld TRADE MARK **PRODUCTS**

Cost Less BECAUSE THEY *Last Longer*

NO FINER WRENCH ANYWHERE!

CRESTOLOY Wrenches are forged from a special alloy steel permitting thinner, trimmer design with greater strength and less weight than conventional adjustable wrenches. Their chrome plate finish is as durable as it is handsome. Choose CRESTOLOY Wrenches for outstanding performance in the toughest kind of service. Sold by hardware dealers everywhere.

8 SIZES IN SINGLE & DOUBLE END TYPES

Number	Size	Capacity
AC14	4"	1/2"
AC16	6"	3/4"
AC18	8"	15/16"
AC110	10"	1-1/8"
AC112	12"	1-5/16"
AC115	15"	1-11/16"
AC118	18"	2-1/16"
AC124	24"	2-7/16"
BC146	same as 4" and 6" above	
BC168	" 6" " 8" "	
BC1810	" 8" " 10" "	
BC11012	" 10" " 12" "	

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Give Wings to Work
®

Sign of the Artisan
Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

PINPOINT THE SOURCE OF PLANT FAILURE *instantly*

SARA

TURBINE NO. 3
GENERATOR NO. 7
CONTROL BLDG.
PAINT SHOP

AUTOMATIC OR MAN. EMER SHUTDOWN
NEUTRAL RESISTOR OVERVOLT RELAY OPER
440 Volts BUS VOLTAGE FAILURE
CO2 RELEASE

'52: JAN15: 8:15 25AM
'52: JAN16: 10:45 03PM
'52: JAN16: 02:53 17AM
'52: JAN17: 11:32 28AM

OBSERVES
REPORTS
RECORDS
automatically

...every deviation from normal operation

- **SARA (T&C's Sequential Automatic Recorder Annunciator) warns of danger—forestalls damage—gives comprehensive picture of plant operation.**
- **Keeps automatic watch on as many as 500 supervised operations.**
- **Prints SEQUENTIAL log, in words, of every change, on continuous permanent record.**
- **Gives visible and audible warning.**
- **Records and prints time, place and description of disturbance in exact sequence . . . even when changes occur within milliseconds.**
- **Costs only slightly more than ordinary annunciator system.**

TALLER & COOPER, INC.
Engineers-Manufacturers
75 FRONT STREET • BROOKLYN 1, N. Y.

REDUCE DATA TO FIGURES
with
T & C's DIGITAL CONVERTER

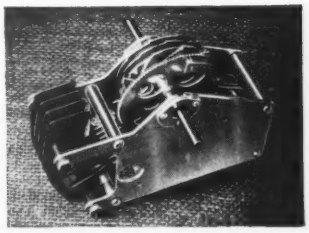
Direct Digital Conversion of temperatures, pressures, voltages, angles, power, RPM, strain gages, wind tunnel balances and other diverse forces.

ACCURATE . . .

PERMANENTLY LEGIBLE RECORD . . .

ELIMINATES HUMAN ERROR . . .

NO INTERPOLATION NECESSARY . . .



ANY shaft rotation can be converted into digital form, and data output can be correlated on printed record, or perforated on tabulating cards—immediately available for computation.

THE FACTS

Incombustible...

That's why TRANSITE® DUCTS confine burn-outs and protect adjacent cables

DESPITE modern precautions, the burn-out is still a potential hazard. Consequently, cables should be given the maximum fireproof protection that Transite Ducts provide.

Transite Ducts confine burn-outs, safeguard adjacent cables from damage and reduce the possibilities of panic and explosion because they are incombustible throughout. Made of nonflammable asbestos and cement, Transite Ducts will not burn, smoulder or generate smoke or fumes. They cannot contribute to the formation of explosive gases.

Nowhere is the fireproof protection of Transite Ducts so necessary as in such vital locations as subways, tunnels and power plants.

As the panel below shows, incombustibility is only one of the advantages of Transite Ducts. For more information, write Johns-Manville, Box 60, New York 16, N. Y.

4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

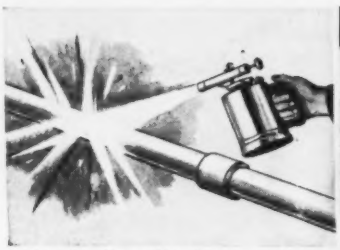
1. Corrosion-Resistant. Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.

2. Permanently Smooth Bore. Transite makes long cable pulls easy. Danger of damage to cables is also minimized.

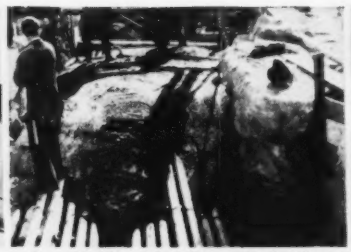
3. Easy To Install. Transite Ducts are light weight, easy to handle. Joints are quickly made. And long 10-ft. lengths reduce the number of joints in line.

4. High Thermal Conductivity. Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.

In Subways, where passenger safety is paramount, fireproof Transite Ducts will, in the event of a burn-out, confine it and reduce the hazard of panic.



Transite Does Not Burn, smoke or fume because its ingredients, asbestos and cement, will not support combustion. It cannot contribute to the formation of explosive gases.



Transite Provides Heat Dissipation, Too. In addition to providing fireproof construction, Transite Ducts permit cables to run cooler, reducing I^2R losses.

Photograph courtesy of Triborough Bridge and Tunnel.

In Vehicular Tunnels, if a burn-out should occur, Transite Ducts limit damage, permit speedier repair and an earlier re-opening for traffic.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

FIGURE 1. Cover bushings on an L-M Round-Wound 15 kva 7200 volt transformer. Note the generous width of skirting for high creepage distance, the four-bolt cover clamp that assures even pressure on gasket and porcelain.

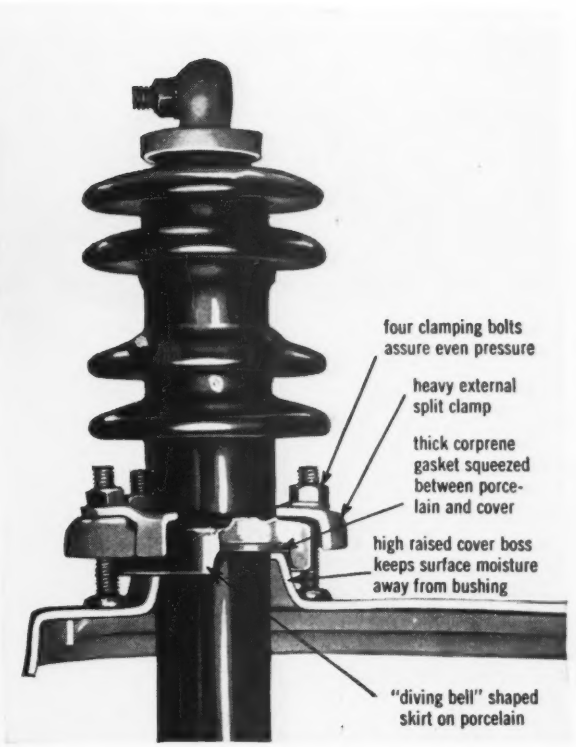

four clamping bolts assure even pressure
heavy external split clamp
thick corprene gasket squeezed between porcelain and cover
high raised cover boss keeps surface moisture away from bushing
"diving bell" shaped skirt on porcelain

FIGURE 2. Close-up of triple-seal against moisture. 1. Deep-skirted porcelain gives "diving bell" effect. 2. Thick corprene gasket, squeezed between porcelain and steel boss. 3. Deep-drawn cover boss keeps moisture away.

Cover Bushings on L-M Round-Wound Transformers Triple-Protected Against Moisture, Corona

"Diving Bell" design porcelain, thick corprene gasket, and high raised boss on cover provide triple barrier

By **ALVIN B. COYLE,**
Manager Transformer Sales
Line Material Company

In the design of cover bushings, L-M engineers have gone to great lengths to eliminate moisture entrance and corona, which would cause undesirable radio interference.

The porcelain itself is designed with exceptionally generous creepage distance and high wet-flashover characteristics. The best grades of electrical porcelain are used, with the surface fully glazed. At the bottom is an extra skirt or lip, which is curved downward to give a "diving bell" effect in keeping moisture away from the gasket.

The porcelain is mounted on an exceptionally high raised boss in the cover, which in itself leads moisture away from the bushing. Between the boss and the porcelain is a thick corprene gasket tightly squeezed by the four-bolt cover clamp. Corprene has the initial hermetic sealing property of synthetic rubber plus the elasticity and non-flowing characteristics of cork to maintain a permanent vapor-proof seal.

The result is a bushing that provides exceptional protection against moisture and breathing; it is corona-free and causes no radio interference.

Get Full Information

These cover bushings are standard equipment on all L-M Round-Wound transformers of 5000 volts and over. For more information on these and other features of these outstanding distribution transformers, ask the L-M Field Engineer; or write Mr. Coyle at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

"Round Wound" is a Line Material Company trademark.

LINE MATERIAL 87R
Transformers
Complete Coordinated Equipment for Distribution Today

LM® ORTO

LET'S LOOK AT THE FACTS

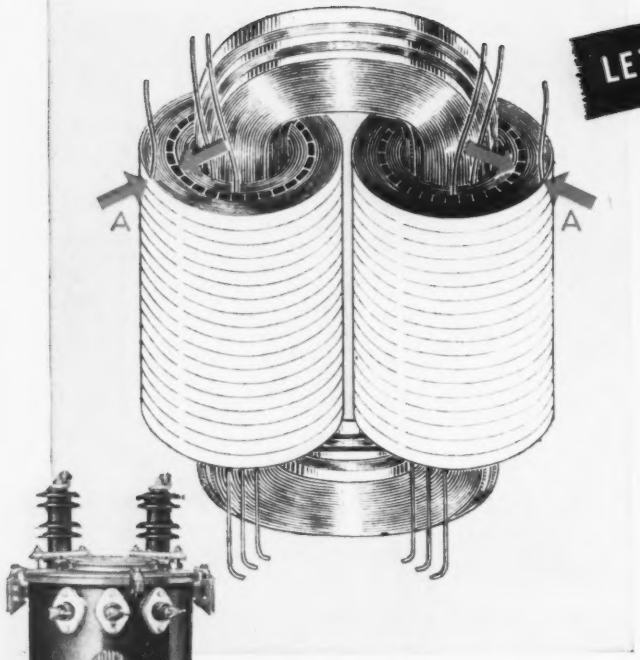


FIGURE 1. In Round-Wound transformers, primary windings are on the outside of the coils, providing ample creepage distance between high voltage leads and low voltage windings. Note the greater creepage distance "A" in this Round-Wound coil than "A" in the shell type construction shown in Figure 2.

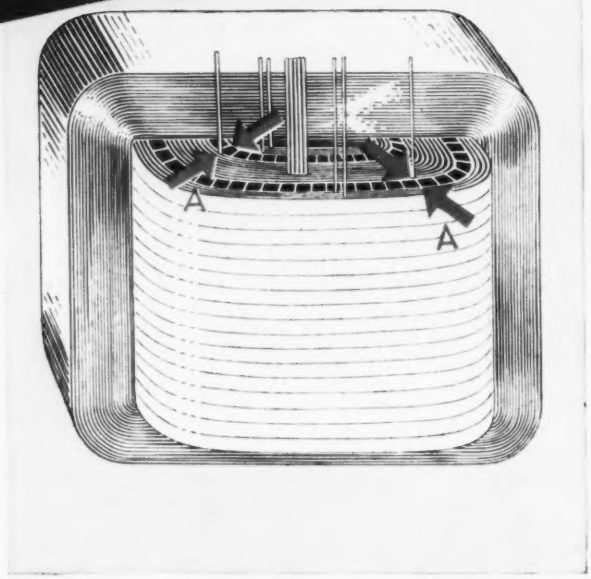


FIGURE 2. In the shell type of transformer, where the primary winding must be sandwiched between secondary windings, and are confined by core steel, primary leads are much closer to the secondary, resulting in far greater danger of flashover. Danger points are the short creepage distances "A" between the high voltage leads and the low voltage windings.

How L-M Round-Wound Design Provides Higher Impulse Level, Higher Short Circuit Strength

by **EARL J. KIRSCH**, Assistant Manager, Transformer Sales, Line Material Company

Both high impulse level and high short circuit strength are desirable characteristics in distribution transformers. A high impulse level will enable a transformer to resist lightning and switching surges of considerable magnitude. Short circuit strength will enable the transformer to withstand the great mechanical forces created by heavy short circuit currents.

High Impulse Level

Principal factors in attaining high impulse levels are the insulation between winding layers and the creepage distances between leads, windings, and frame. Lightning surges attempt to flash over or through insulation to the ground.

A particularly weak point in many transformers occurs across the end-coil surfaces where leads are brought out of the coils. As shown in Figure 1, it is a characteristic of the Round-Wound type of design that there is substantially more clearance between leads than is obtained with the one-coil shell type shown in Figure 2, where primary winding is often sandwiched between two layers of secondary, and more closely confined by core steel.

Core Versus Shell Type

In the L-M Round-Wound transformer, all of the primary winding is on the outside of the secondary winding. Leads are taken from the outside layer of the primary winding to the primary bushing, providing maximum creepage and flashover distances (Figure 1). In the shell type (Fig. 2), the designer must sandwich the primary winding between two layers of secondary to gain minimum acceptable clearance between the high voltage primary and the core, and to hold the impedance within acceptable limits.

Another problem is that surges tend to "pile up" on the end-turns nearest the bushing—which is why so large a percentage of burnouts occur at this point. Because of the design of the Round-Wound transformer, there is maximum separation of primary windings from ground, and maximum insulation between high and low voltage windings and between coils.

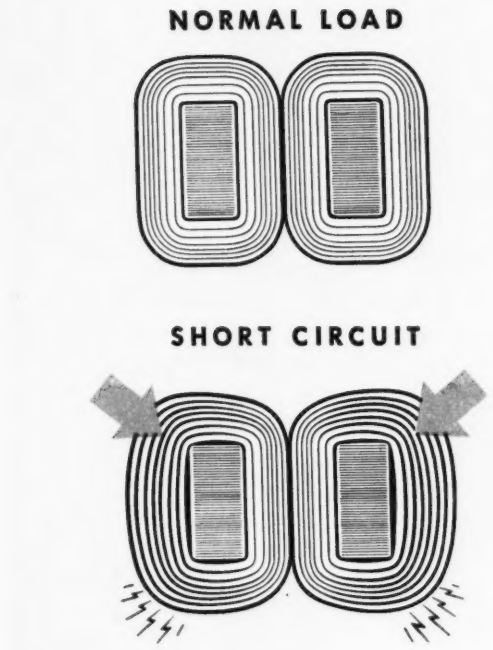


FIGURE 3. Under short circuit currents, rectangular coils tend to distort to a round shape. The forces may be violent enough to damage insulation or even cause complete failure of the coil.

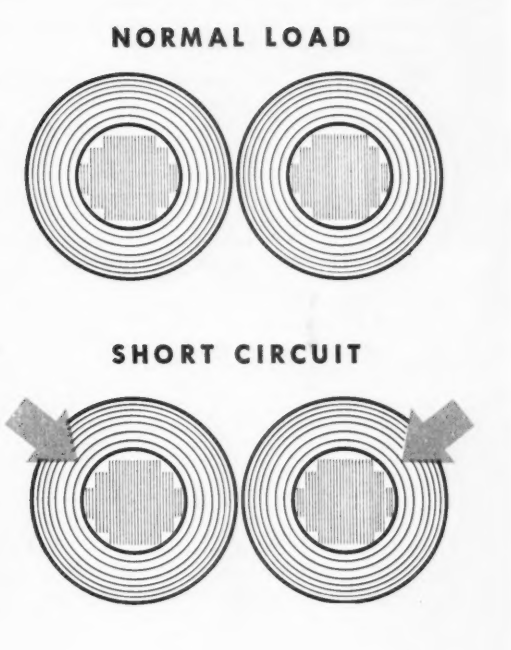


FIGURE 4. Since the coils on Round-Wound transformers are already round, short circuit currents produce very little distortion. Thus "Round-Wounds" have appreciably higher short circuit strength.

The fact that the Round-Wound coils are *round* means that they have not been malleted into a rectangular shape; there are no sharp corners and weak spots caused by damage to the insulation from malleting.

Basic design, plus generous insulation, assures the exceptionally high impulse strength of Round-Wound transformers that is proved not only in laboratory tests but also is borne out by long life performance in actual field service.

Short Circuit Strength

The round coils of the Round-Wound transformer are also a principal factor in the outstanding short circuit strength of this design. As shown in Figure 3, when rectangular coils are short-circuited, the heavy currents tend to force the windings into circular shape. This is very likely to result in damage to the insulation.

But round coils, already circular, are not stressed out of shape, and therefore are not subject to distortion and resulting damage (Figure 4). Thus round coils, plus substantial coil bracing, give Round-Wound transformers inherent advantages in short circuit strength, which contributes materially to their longer life.

Because of their design characteristics, and because of the elimination of variables in production, L-M Round-Wound transformers amply meet NEMA standards with a generous margin of safety.

For Complete Engineering Data

Ask the L-M Field Engineer for the information you want, or write Mr. Kirsch at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

Some Outstanding Characteristics of L-M Round-Wound Transformers

High Short Time Overload Capacity

Better Regulation at all power factors

High Impulse Level, with ample creepage distances and generous insulation

High Short Circuit Strength because round coils have less tendency to distort

Low Exciting Current because the core is not cut or disturbed after annealing

Better Loss Ratios with lower total losses

88

LINE MATERIAL
Transformers

Complete Coordinated Equipment for Distribution Today

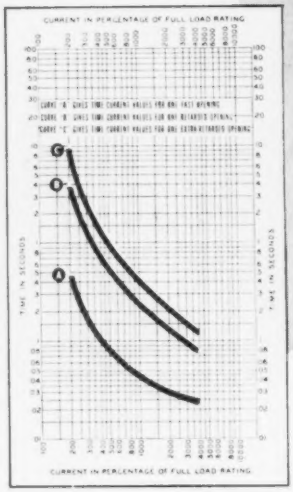
"Round Wound" is a Line Material trademark.

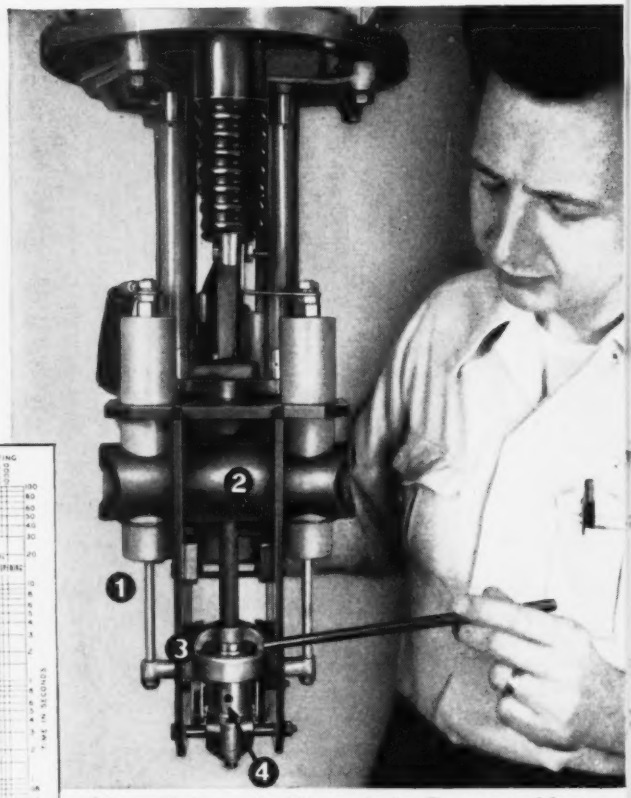
L-M's Kyle Type E 23 kv recloser outranks all others in its class for dependability, long service, low maintenance, and interrupting capacities. New higher interrupting capacity and 150 kv BIL assure ample safety factor.

"Universal" terminals for copper or aluminum conductor
Oil-filled clamp-on bushings—extremely low radio noise level
Heavy aluminum cover with operating handle, operations counter, and optional Kyle non-reclosing device lever under sleet hood
Heavy tank with welded bottom for better support, better protection
KYLE
ORTO

CHOICE OF SEVEN SEQUENCES

Only Kyle reclosers offer choice of three time-current curves and seven standard operating sequences. Curve A, fast; curve B, retarded; curve C, extra-retarded. Permits close coordination with fuses and other reclosers in series.





Oil cross blast arc extinguishing mechanism. The contacts of finest arc-resisting material (1) draw two arcs in series. Gas formed by one arc blasts the oil in the cross-blast chamber (2) across the other arc, extinguishing it instantly. The engineer points to the contact buffer mechanism (3), which permits varying contact opening speed by means of a removable plug (4). This insures best interrupting performance at both 23kv and up to 14.4 kv.

L-M's KYLE Type E 23 kv Recloser Now Interrupts up to 1750 Amperes at 23 kv

To meet heavier load requirements, interrupting capacities are increased to 2500 amperes at 14.4 kv, 1750 amperes at 23 kv. Provides full 150 kv BIL insulation, giving greater insulation safety factor with longer life. For all distribution voltages from 2.4 to 23 kv.

The heavy insulation and the improved oil cross blast method of arc extinction make the Type E an outstanding recloser for high voltage application, and provide an intermediate duty recloser up to 14.4 kv.

Oil-filled clamp-on bushings provide radio noise level well below NEMA standards. Plated Universal terminals for either copper or aluminum conductor. The recloser is available with a choice of eight coil ratings, three time-current curves, and seven tripping sequences. Coils and sequences are easily changed *in the field.*

Like all Kyle reclosers, the Type E is filled with ORTO®, L-M's oxidation-resistant transformer oil.

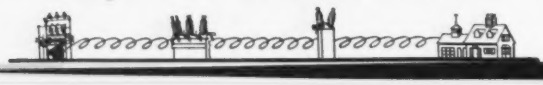
Get details on this exceptional recloser, which has proved so successful in service. Ask the L-M Field Engineer for copy of bulletin on the Kyle Type E, or write Line Material Co., Milwaukee 1, Wisconsin (a McGraw Electric Company division).

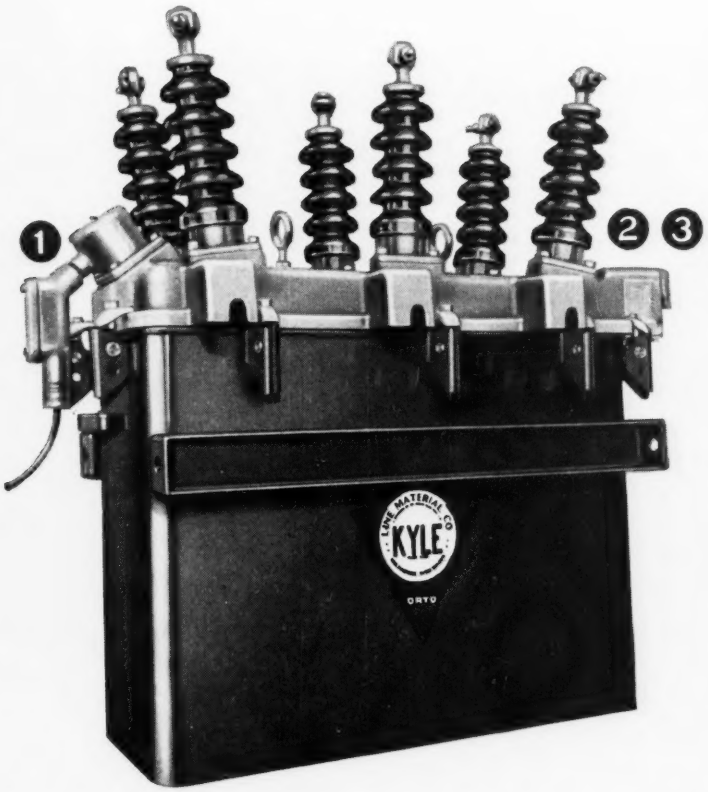
Type E Single Phase
Nominal Rating 23 kv, BIL 150 kv

Rating Amperes	Minimum Tripping Current Ampere	Interrupting Ratings* Symmetrical RMS Amperes at Maximum Phase to Phase Nominal Voltage of: 14.4 kv	23 kv
5	10	200	125
10	20	400	250
15	30	600	375
25	50	1000	625
35	70	1400	875
50	100	2000	1250
70	140	2500	1750
100	200	2500	1750

*Recloser interrupting ratings are based on the maximum test circuit X/R ratio of not less than 8, and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.

LINE MATERIAL
Kyle® Reclosers





L-M's Kyle Type 3H Recloser Provides Automatic 3-Phase Protection

With three units in one tank, linkage tolerances can be controlled more closely, insuring more accurate and dependable 3-phase operation of the recloser.

The Kyle Type 3H 3-phase recloser provides individual reclosing and resetting on each phase for temporary faults. In case of permanent fault on any one phase, the recloser locks out *all three phases simultaneously*.

The Kyle 3H Recloser can be coordinated with sectionalizers or branch line fuses to isolate permanent faults to small sections of the system. Because all three units are in one tank, there is no external linkage; and greater operating accuracy and dependability are assured.

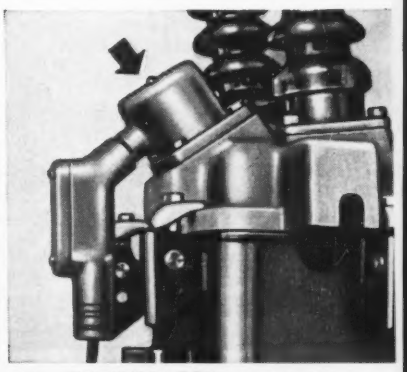
Positive toggle action; fast opening and closing do not depend on gravity. The Kyle hydraulic mechanism has proved itself over years of service to be dependable and trouble free.

The Kyle 3H can be applied on systems up to 15 kv, with nominal load ratings from 5 to 50 amperes and minimum trip currents from 10 to 100 amperes. Coils are easily changed right in the field. Interrupting ratings from 150 to 1200 amperes. Trip-free operating handle and all other Kyle safety features. Plated Universal bushing terminals for copper or aluminum. Available with the accessories shown at the right.

Get the Whole Story of Automatic Protection

Ask the L-M Field Engineer for a copy of Bulletin CR-1, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

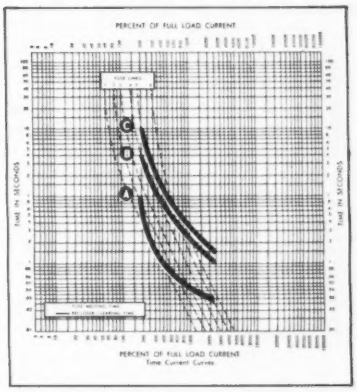
Like all Kyle reclosers, the Type 3H is filled with ORTO®, L-M's oxidation-resistant transformer oil.



1 SHUNT TRIP COIL: an optional accessory that permits tripping the recloser from a distant point so it will not reclose. Or for ground fault-tripping with relay or other control equipment, the coil locks out the recloser in one fast operation. Must be built in at the factory.

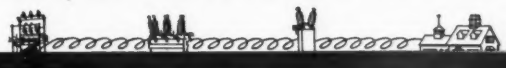
2 KYLE NON-RECLOSING FEATURE: when control lever is down, this accessory prevents automatic reclosing, providing fast lockout on the first operation, for greater safety for men and equipment during hot line work. Available on all Kyle reclosers.

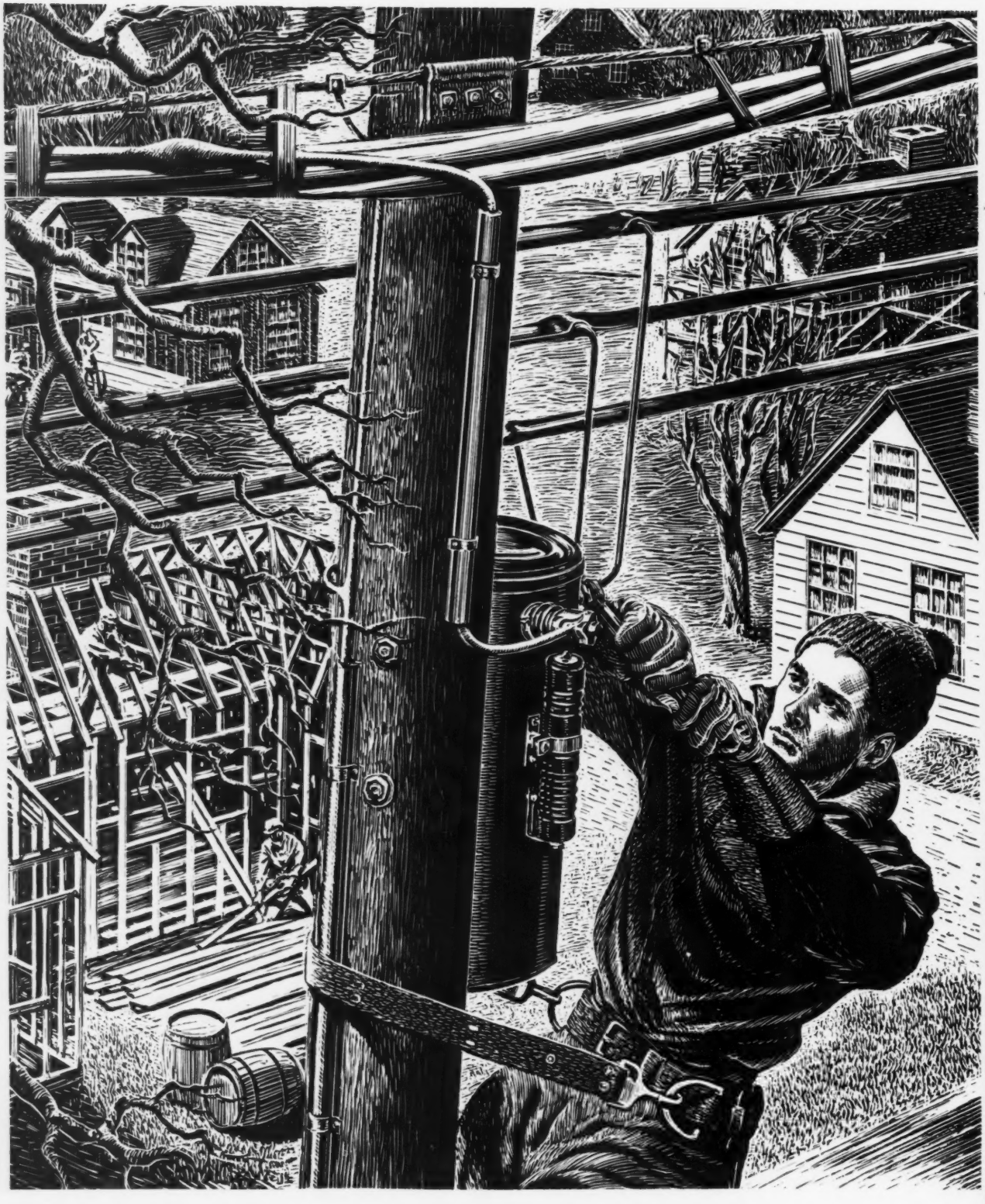
3 AUXILIARY SWITCH: an SPDT switch that may be attached to a Kyle 3H recloser. It may be used either to operate a remote indicator light to show when the recloser is open and closed; or as a limit switch to cut off current from the shunt trip coil after it has operated.



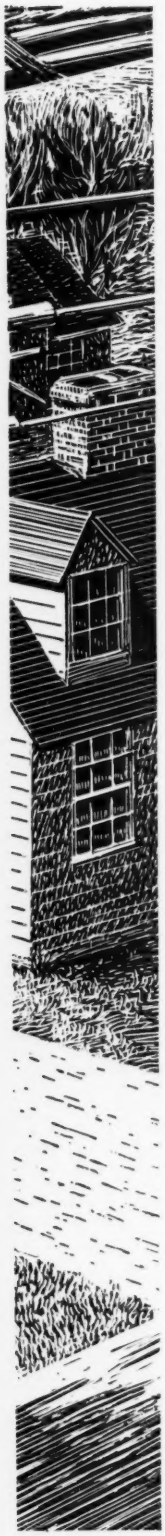
Kyle Reclosers offer the widest choice of time-current curves and sequences. You can select from Curve A, fast; B, retarded; C, extra-retarded. Choice of seven sequence combinations; sequences quickly changed right in the field.

LINE MATERIAL
Kyle® Reclosers





When electric utilities install G-E Super Coronol cable they obtain extra capacity compared to older-type rubber-insulated cables. Moreover, because the normal rating of Super Coronol cable has been raised twice since it was first introduced, those electric utilities who installed it before 1952 can obtain extra capacity without extra cost.



Early users bought this cable on the basis of longer life... Now they find

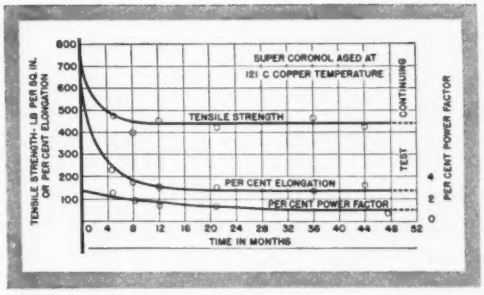
G-E Super Coronol Cable offers them Extra Capacity Without Extra Cost

Power companies that bought G-E Super Coronol* cable when it was first introduced can now handle as much as 12% more power with the cable than its original rating permitted. In many cases this means that additional cables or new ducts are not required to provide for increased power demands. Here is why:

In 1944, General Electric announced a radically improved cable, later called Super Coronol, that had exceptional resistance to almost all cable-destroying elements. It was rated 75 C copper temperature—as were other heat-resistant rubber-type cables. Also the new cable was largely impervious to the effects of heat, acids, ozone, and most other factors that shorten cable life. It was for these reasons of indicated long-life that electric utilities first purchased this new cable.

Two years later, G.E. raised the temperature rating of this new Super Coronol cable to 80 C. This was news. It was the highest rating ever announced for a rubber-type cable. Early users could add up to 6% more load to existing Super Coronol cable circuits with little or no effect on cable life. Then last year General Electric again raised the rating of Super Coronol cable—this time to 85 C copper temperature for 0-8000 volts thus permitting another 6% boost in load.

Registered Trade-mark General Electric Company

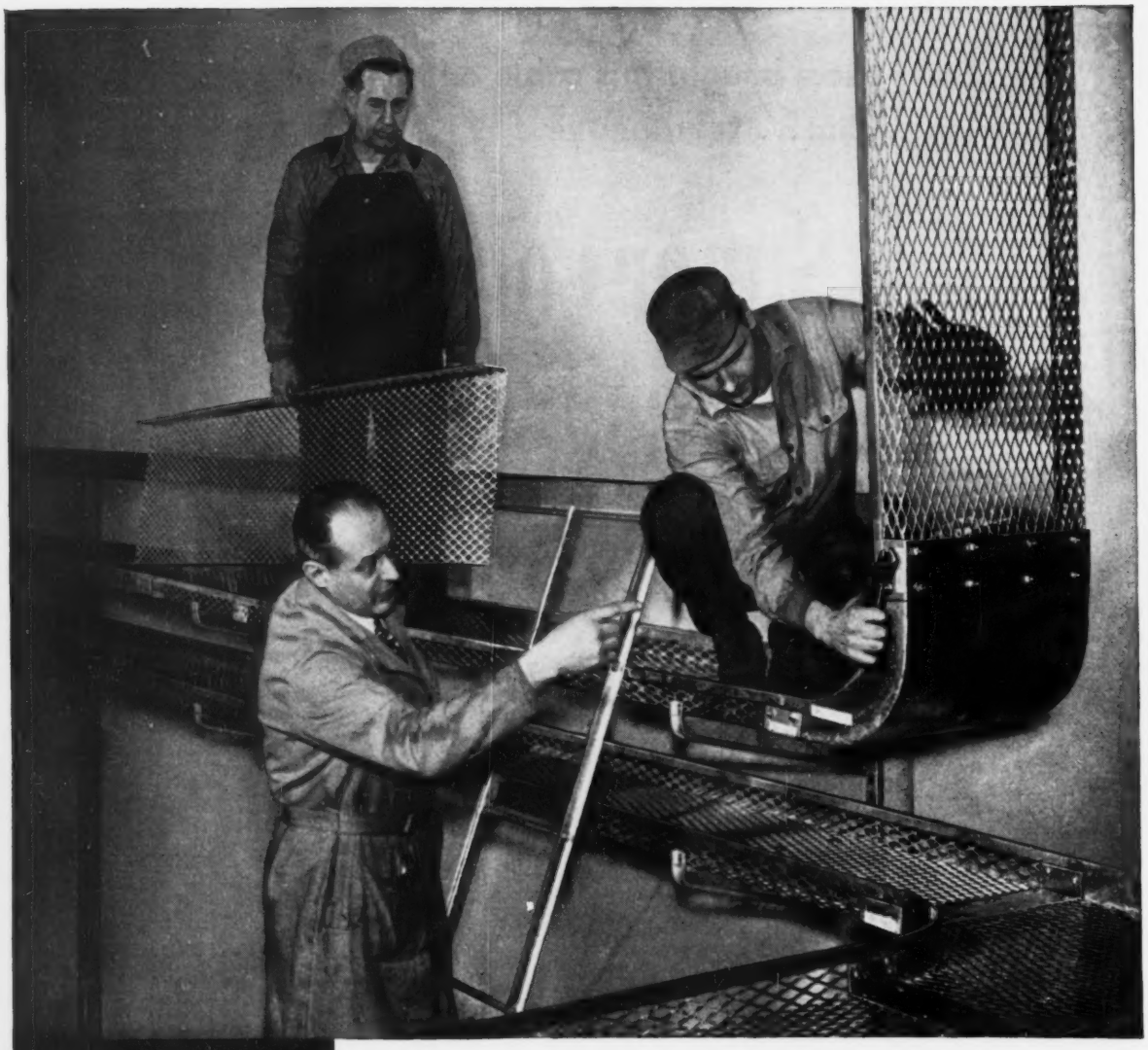


This curve shows the results of aging tests on Super Coronol cable to date. The tests are being continued. Note that these results were obtained at a copper temperature of 121 C. This test, and others like it, formed the basis for increasing the cable's normal rating. The ample factor of safety is obvious.

Although increased ratings of these magnitudes cannot always be obtained, you *can* expect wire and cable from General Electric to incorporate the latest achievements of research in insulation and the economies of efficient manufacturing. It will pay you to call in your G-E Wire and Cable specialist whenever you have a cable problem. Construction Materials Division, General Electric Company, Bridgeport 2, Conn.

You can put your confidence in—

GENERAL ELECTRIC



LIGHT

. . . . BUT STRONG!

COPE Cable Trough is both strong and light. These two important factors help to give you a simple and versatile standard system for supporting cable, which will save you in . . . material, man hours and costs.

Write today for full information on COPE Cable Trough.

You know Cope by these products

T.J. Cope INC.

711 South 50th St. Philadelphia 43, Pa.

Look!

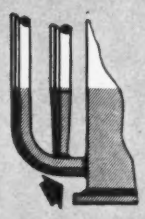
THIS TRANSFORMER BEATS CORROSION AND FLOODING

ALLIS-CHALMERS

NETWORK TRANSFORMERS

SPIRAL-WOUND GASKETS . . . Performance Proved

Spiral-wound bushing gaskets consist of alternate plies of preformed spring-like metal and nonmetallic fillers, providing resilience that maintains a leak-proof seal. The gasket adjusts itself to changes in operating conditions.

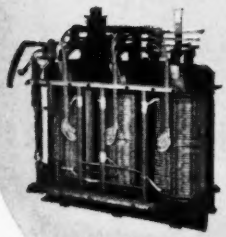


SPECIAL SURFACE TREATMENT

To provide high moisture resistance there's grit blast cleaning plus three coats of baked-on phenolic paint. Added to this is a special coat of bituminous compound that covers surfaces and cooling tubes in the base areas.

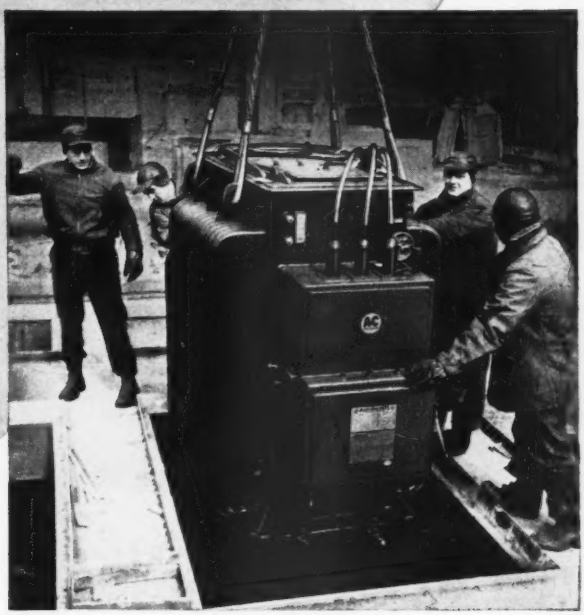
WELD SEAL CONSTRUCTION

The main cover and switch compartment are welded to the tank. In this way gasketed joints are eliminated . . . preventing breathing, extending insulation life and reducing requirements for filtering.



HIGH THERMAL CAPACITY

Characteristic of this compact low-loss design are the high thermal capacities for severe load conditions. Sturdy, time-proved core and coil construction is built to meet repeated short circuit stresses of network operation.



This 500-kva sealed network transformer is one of ten Allis-Chalmers network transformers serving the new Gateway Center in Pittsburgh. Accessories are located for maximum convenience.

NO DOUBT ABOUT IT! Underground vault conditions are rough. But Allis-Chalmers network transformers are specially designed for such underground service.

They're built to withstand flooding and complete submersion in water. Their surface is protected against the effects of industrial gases, dust, salt, rain or mild atmospheric acids. As electric utilities' operating records show, they supply the continuous energy necessary for health and safety in your city.

SERVICE RELIABILITY SAVES MONEY

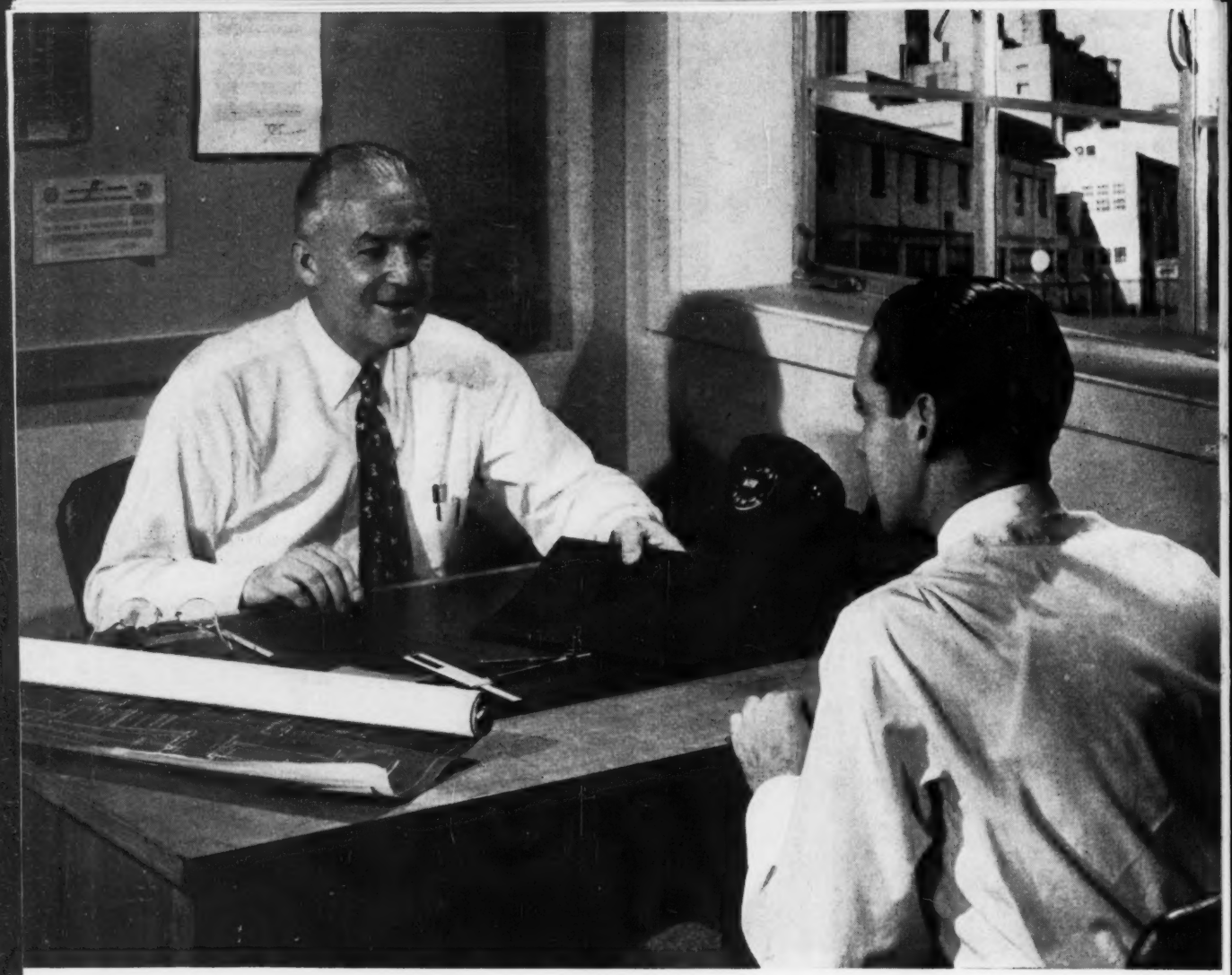
Stability for dense load areas, improved voltage regulation, elimination of costly substations and hazardous overhead lines — these are but a few of the important benefits of network systems. They are brought out best over a long period of time with A-C network transformers.

You'll find your every day requirements are successfully served by these *standard* designs: oil-filled, *Chlorextol* liquid filled or sealed dry-type. So if you're planning to expand your network system you can select the specific Allis-Chalmers transformer best for your system.

For more information about this standard line of network transformers write Allis-Chalmers, Milwaukee 1, Wisconsin, or get in touch with your nearby A-C district office. A-3921

Chlorextol is an Allis-Chalmers trademark.

ALLIS-CHALMERS A-C ALLIS CHALMERS



When you have a water conditioning problem—the first thing to do is call

cochrane

Whether your requirements are large or small, call a Cochrane Water Engineer. Supported by his recommendation, you'll be sure you're right.

. . . water conditioning is a problem for specialists. The Cochrane people specialize in water engineering and water conditioning equipment. And since Cochrane manufactures all types of water treating equipment their recommendations are unbiased. Cochrane engineers will show you how to obtain most economically the quality of water you want. Call Cochrane first when you have a water conditioning problem.

WHY IS THIS

THERE'S A COCHRANE SOFTENING PROCESS TO GIVE YOU THE WATER YOU WANT

When you have a water softening problem—Cochrane Water Engineers can give you the right answer. Through many years of experience in all types of water treatment—including ion exchange—Cochrane offers five distinct processes, each with specific advantages for a particular job:

Hot Zeolite Process
Sodium Zeolite
Hydrogen Zeolite
Dealkalization
Demineralization

A Cochrane Water Engineer will be glad to explain the differences in these processes. He'll show you how the one process best suited to your requirements will provide water of the quality you want, cheaply and abundantly—from any raw water.

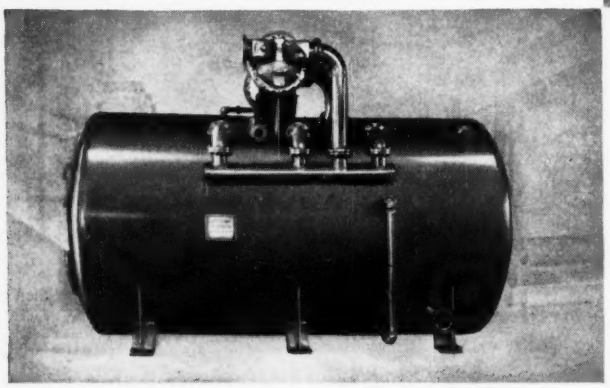
COMPLETE DEAERATION OF BOILER FEEDWATER

Cochrane provides all types of Deaerators to meet any requirements:

Tray-Type Deaerators
Atomizing Deaerators
Deaerating Hot Water Generators
Cold Water Deaerators

One of these units can be applied to your particular boiler feedwater requirements and built of materials suited to your service. A Cochrane Water Engineer will bring you the benefit of Cochrane's long experience in conditioning boiler feedwater.

Cochrane Zeolite Softener installed with a HYDROMATIC Single Control Valve.



Cochrane Tray-Type Deaerator for Central Station installation in the Southwest.

Cochrane equipment covers the full range of water conditioning:

HOT PROCESS SOFTENERS
HOT AND COLD ZEOLITE SOFTENERS
DEAERATORS & OPEN HEATERS — DEMINERALIZERS
DEALKALIZERS — DEGASIFIERS
REACTORS & CLARIFIERS
CONTINUOUS BLOWOFF SYSTEMS
STEAM SPECIALTIES — CONDENSATE RETURN SYSTEMS

To give you prompt consultation and service, Cochrane Water Engineers are strategically located in 29 cities throughout the United States. Write today for the address of our office nearest you.

COCHRANE CORPORATION — WATER ENGINEERS FOR 90 YEARS — 1863 - 1953

cochrane

corp. 3146 N. 17TH STREET, PHILADELPHIA 32, PA.

In Canada: Canadian General Electric Co., Ltd., Toronto
In Mexico: Babcock & Wilcox de Mexico, S.A., Mexico City
In Europe: Recuperation Thermique & Epuration, Paris

BIDDLE

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS

WHY IS THIS STRAIN CLAMP SPECIFIED FOR DEAD-ENDING?

DUW-A

In overhead distribution applications where clearance between phases is limited, this Burndy straight-line strain clamp insures rapid installation, dependable performance and easy re-sagging because:

- Superior alloys and structural design provide maximum strength, permit high tightening torque—with minimum bulk.
  Holding power on aluminum or copper conductors always exceeds 90% of rated breaking strength of the conductor, and in most cases equals the rated strength. (Can also be used on ACSR; refer to Burndy for details.)
- Maximum holding power — without injury to conductor. Saddle under U-bolts distributes clamping pressure uniformly. Tapered front end of groove permits gradual pickup of stress from conductor to clamp. Belled saddle and groove entrances prevent nicking or abrading the conductor strands.
- Long neck facilitates carrying through of jumper loop.
- Design eliminates pockets where water might accumulate —guarding against corrosion.

Aluminum cable to 1510.5 Mcm—Copper to 2000 Mcm.

Consult—"Connectors for Aluminum Cable in Overhead Distribution," Catalog AL53.

BURNDY

NORWALK, CONNECT. FACTORIES: New York • California **TORONTO, CANADA**

53-3 EXPORT: Philips Export Corporation

BIDDLE
Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

BRIDGE-MEG®

SAVES THE COST OF TWO INSTRUMENTS

SAVES TESTING TIME

The Bridge-Meg is really two instruments in one. It combines a Wheatstone Bridge for measuring conductor resistance of coils, resistors and circuits, and a Megger direct reading ohmmeter for measuring electrical insulation resistance. A Varley Loop feature for locating faults on wires may also be included. The combined, compact instrument weighs about 15 lbs.

Practically everything you need is provided in the Bridge-Meg for electrical resistance measurements from a fraction of an ohm up to 1000 megohms. A multi-position rotary switch changes internal connections between insulation resistance tests, Wheatstone Bridge and the Varley Loop connection. Scale reads directly in ohms and megohms.

The Bridge-Meg requires no batteries or outside source of current. Test current is supplied by a hand-cranked generator. Its constant-voltage mechanism eliminates the "human element" in the speed of turning the crank.

Available complete with carrying case and test record cards in a standard selection of 5 ohmmeter scales.

Write for 12-page **Bulletin 21-60-W.**

WHAT THEY SAY ABOUT THE "TTR" TRANSFORMER TURN RATIO TEST SET . . .

—From Transformer Manufacturers:

"We use this instrument almost continuously 24 hours a day, 5 days per week, and have come to depend on it as part of our production test facilities. Our experience has been that the instrument is accurate, dependable and generally very valuable in our work."

"You will be interested in hearing that your 'TTR' Tester has been doing an excellent job for us."

—From Large Power Companies:

"We like it very much,—don't know how we ever got along without it."

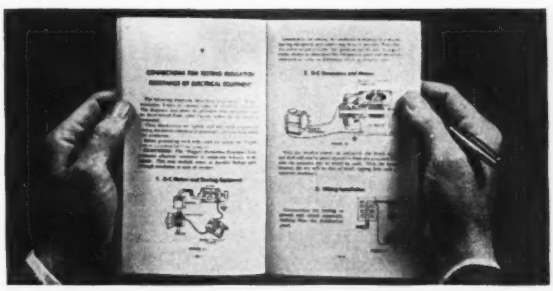
"The 'TTR' Set has proved valuable in making acceptance tests on new transformers and has materially reduced the time involved in testing."

"We have found the 'TTR' Set was successful in detecting a shorted section of turns in a transformer in operation, which permitted it to be taken out of service before more serious trouble developed."

"We consider the 'TTR' Set one of the most valuable instruments for our transformer work. It saves time and calculations, and gives more accurate results than the other methods we'd been using. Our transformer men depend on the set—so much—there is seldom a day the set is not in use."

The names of these and other companies using the "TTR" Set are available on request. For information regarding this unique instrument, write for **Bulletin** 55-W

MEGGER® MANUAL tells you how to test ELECTRICAL INSULATION



This 94 page manual is in demand by educators as well as practical electrical men. It covers subjects of necessity to anyone who is responsible for electrical equipment.

"Why Test Insulation Resistance?"
"Preparation of Apparatus for Test"
"Tests When Drying Out Wet Apparatus"
"Temperature Correction"
"Methods and Interpretation"

These are but a few of the 14 chapters that are built around the subject of testing electrical insulation resistance . . . and, of course, effective use of the Megger Electrical Insulation Resistance Tester sold in the U. S. only by the James G. Biddle Co. Supply is limited. Please write on your company letterhead for **INSTRUCTION MANUAL 21-J-W.**

JAMES G. BIDDLE CO. B830
1316 Arch St., Philadelphia 7, Pa.

Please mail me

☐ Bulletin 21-60-W ☐ Bulletin 55-W ☐ Bulletin 21-J-W

*Name*_____

*Job*_____

*Company*_____

*Address*_____

Thousands of AnacondA Potheads—like the one in center of this specially posed photograph—are available from relatively few, readily-interchangeable components. A wider variety than ever before—yet stockroom parts inventory is actually less. To fill *all* your pothead specifications, you need fewer parts.

A neater and better job can be obtained by using an AnacondA Jointing Kit. These unit packages of jointing materials contain all necessary materials to make one complete joint on a specific size and type of cable. An AnacondA Jointing Kit eliminates the possibility of inadequate materials . . . cuts down the need for large stocks.

Greater stability of AnacondA Insulating Compounds is based on extensive research for balanced compositions with proper physical and electrical characteristics for any installation.

ANACONDA CABLE ACCESSORIES

Service is better than ever on this complete line, designed by power-cable specialists for use with any make of cable. Expanded facilities keep pace with trend toward ordering cable and cable accessories together.

Anaconda's 20-year-old Cable Accessories Department is busier now than ever. In new and expanded quarters it is turning out greatly increased quantities of potheads, jointing kits, insulating compounds and paints. Back of this activity lies a story of increased demand by utilities, railroads, industrials, and equipment manufacturers for cable accessories that are engineered by power-cable specialists. Here, old and new customers have found the consistent quality, good engineering, ease of installation and low cost of maintenance traditional with Anaconda for years.

ANACONDA Potheads spearhead the line. Available in such types as capnut, switchgear, transformer, disconnect, and through types, they feature an interchangeability of parts equalled nowhere else.

More than 2000 different pothead assemblies can be furnished from standard parts for any particular conductor size and voltage rating in the multi-conductor capnut type alone!

Another popular item is the ANACONDA Unit Package of Jointing Material. In one package (see illustration) is everything needed to make a complete joint on a specific size and type of cable. The kit saves time, simplifies ordering, minimizes the need for storeroom stocks, and helps assure installation of a joint engineered for the particular application.

To keep pace with the increasing demand for ANACONDA Accessories, it has been necessary again to greatly increase the facilities of the Cable Accessories Department. This Department is now in a position to promise prompt shipment on most of your orders. Call your Anaconda Representative. He is always ready to help you with your cable and accessories problems. 52460

Accessories for all types and sizes of bare and insulated conductors.

ANACONDA®

Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

Gentlemen:
I'm interested in AnacondA Cable Accessories.

- ☐ Have your representative call.
- ☐ Send me your 100-page Pothead and Terminal Catalog.
- ☐ Send me your Jointing Material Catalog.
- ☐ Send me *complete* Cable Accessories Catalog.

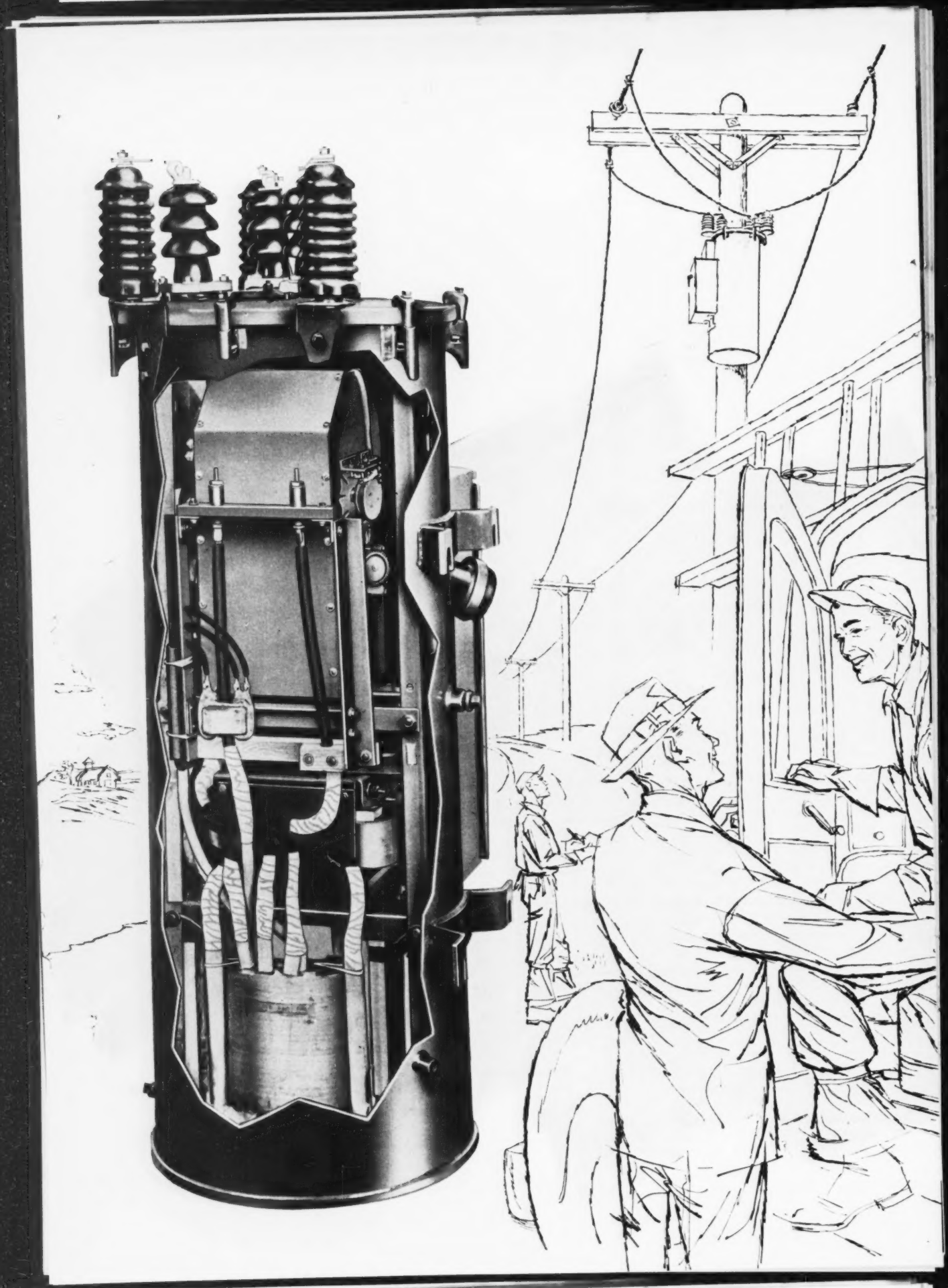
NAME .....

COMPANY .....

TITLE .....

ADDRESS .....

CITY ..... STATE .....



Send me *complete* Cable Accessories Catalog.

CITY ..... STATE .....

This 16 step regulator maintains close regulation with fewer operations...fewer moving parts!

We proved this fact in actual field tests! It was established conclusively that the Westinghouse URL-16 Step Voltage Regulator could maintain close regulation with fewer operations. Several URL-16 exclusive features contribute to its accurate performance.

- ***The CJ-1 Voltage Regulating Relay*** with simple adjustments for balanced voltage and band width, provides inverse time delay to automatically maintain a ± 1-volt band width.
- ***Positive arc interruption*** and minimum voltage variation result from the use of a simple quick-break, direct-drive Geneva-geared tap changer.

A simple design cuts maintenance costs!

The fundamental design of URL-16 reduces the number of parts necessary to complete a contact cycle. Only sixteen 1¼% steps cover the entire 20% range. Fewer operations indicate less maintenance. Also, the simple direct-drive Geneva-geared mechanism omits indirect drive devices which may require maintenance.

A simpler design means lower total cost. Fewer operations with fewer moving parts promise lower operating cost. That's why the URL-16 provides the most economical way to obtain close regulation . . . satisfied customers . . . increased revenues.

Get complete information

New Booklet B-5841 contains complete information on the URL-16 Regulator. For your copy contact your Westinghouse representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-10389

YOU CAN BE SURE...IF IT'S Westinghouse

all along the line....

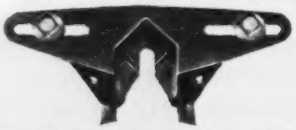
MIF POLE HARDWARE

improves performance
simplifies installation
gives longer service life

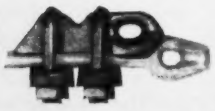
PLANT OF
MALLEABLE IRON FITTINGS CO.

POLE MOUNTS

JENNE STRAND HOLDERS



TRANSFORMER MOUNTING PLATES



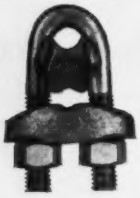
AUXILIARY EYES

GUY HOOKS

POLE EYE PLATES

SPAN GUY HOOKS
HOUSE BRACKETS

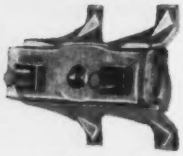
SPAR ARM GAINS



GUY CLAMPS

CABLE SUSPENSION CLAMPS

Light Duty



Medium Duty

UNIVERSAL CLAMPS

CURVED WASHERS
Rectangular — Square

MALLEABLE IRON FITTINGS CO.

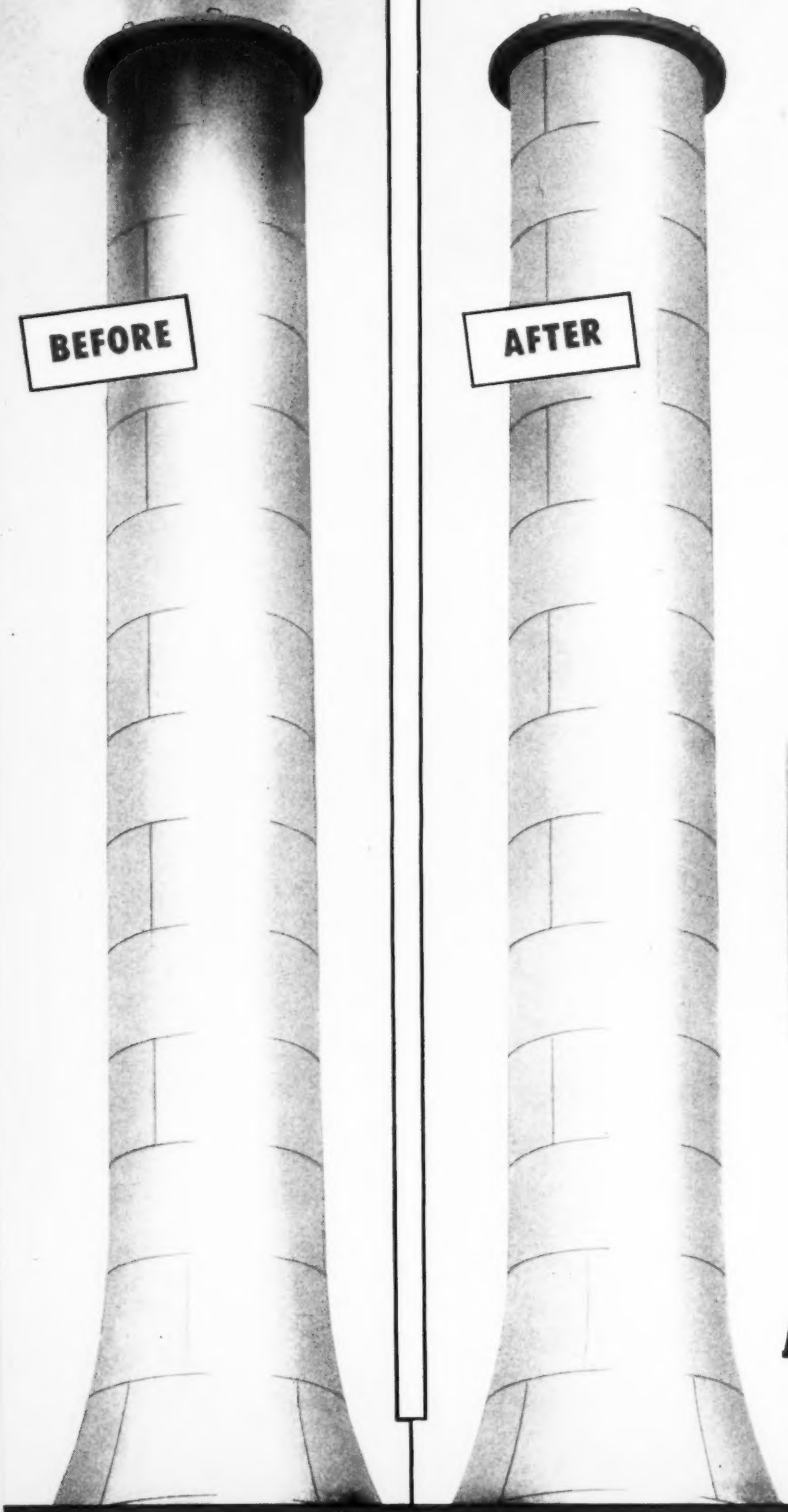
Pole Hardware Division Branford, Connecticut

N. Y. Office: 30 Church St.
Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

MIF

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • B. H. McCoin, Knoxville, Tenn. • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Calif. • L. G. Wendegatz, Kansas City, Mo. • Williams Sales Co., Fort Myers, Fla. • Williamson Sales Co., Shreveport, La. • O. C. Witte Co., Detroit, Mich.

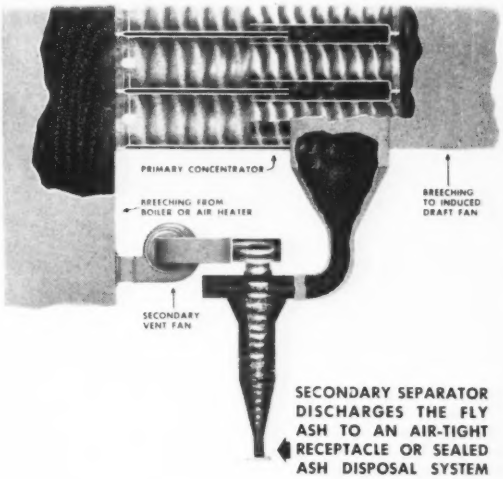
American Blower . . . a time-honored name in air handling



Installation of an American Blower Type ST Fly Ash Precipitator can make the difference shown here.

On a given application, as the load falls off and fly ash becomes harder to catch, the ST Precipitator automatically maintains a higher efficiency than any other collector of mechanical type.

Contact the American Blower or Canadian Sirocco Branch Office nearest you. They are conveniently located throughout the United States and Canada to provide complete information concerning the benefits of installing fly ash precipitators in your plant to meet your specific needs. Call on one today.



SECONDARY SEPARATOR DISCHARGES THE FLY ASH TO AN AIR-TIGHT RECEPTACLE OR SEALED ASH DISPOSAL SYSTEM

AMERICAN BLOWER

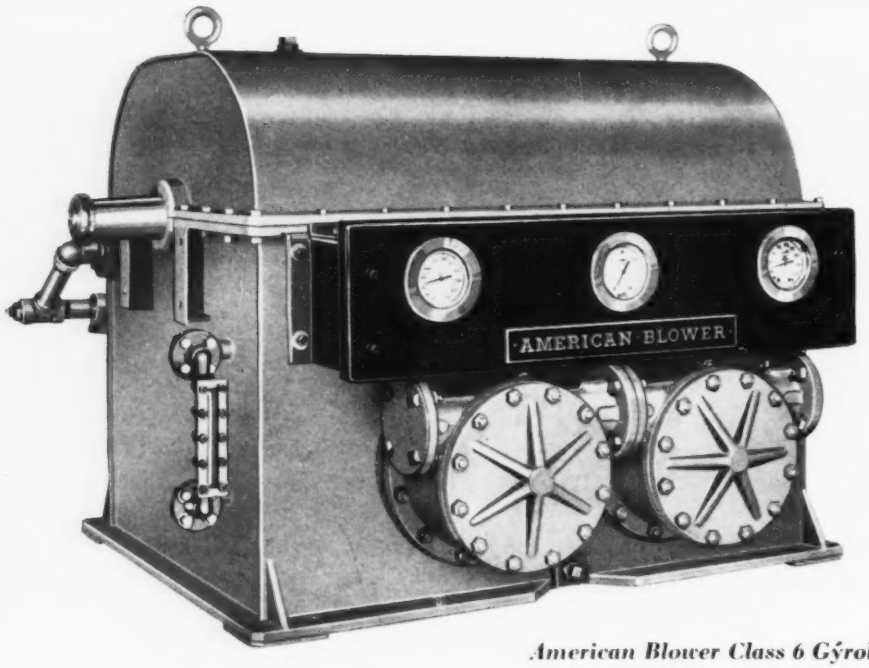
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

American Blower . . . a time-honored name in power plant equipment



American Blower Class 6 Gýrol Fluid Drive

Memo to Power Plant Men —

You can enjoy important power savings, flexible stepless control, reduced maintenance, and get lower pressures at reduced flows for your boiler-feed-pump operation. Install an American Blower Adjustable Speed Gýrol Fluid Drive with a constant speed driving motor.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

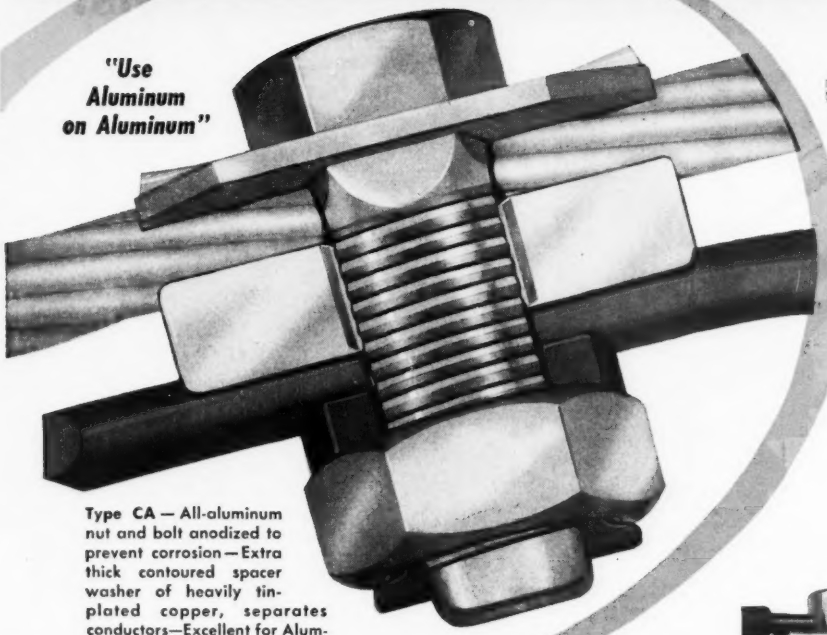
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

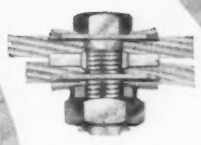
SAFEGUARD YOUR ALUMINUM!

Use These Tried-and-Proved Fittings

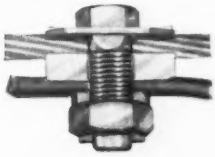
"Use Aluminum on Aluminum"



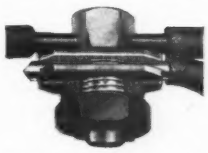
Type CA — All-aluminum nut and bolt anodized to prevent corrosion — Extra thick contoured spacer washer of heavily tin-plated copper, separates conductors—Excellent for Aluminum-Copper combinations.



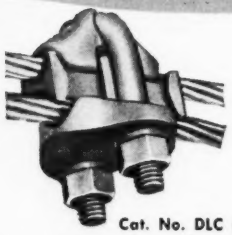
Type AAW — For Al. to Al. — All-aluminum connector with 2 bell-mouthed washers and aluminum contour spacer to hold wires in shape. Alumilite treated.



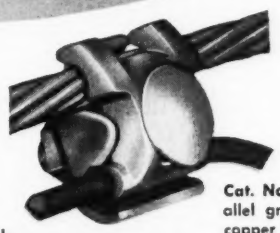
Type HPW — Tin-plated Duronze connector for Al. to Cu. or Al. to Al.



Type H-3-W — Primarily for 4, 6 and 2 Al. tap to Cu. line. Duronze connector with tin-plated bolt and 2 grooved bi-metallic washers.



Cat. No. DLC 6-0 — Aluminum dead end loop clamp, covers wire range 6 — 1/0 ACSR.



Cat. No. PAC 6-0 — Parallel groove clamp with copper liners soldered to aluminum body on one side. Also made for Al. to Al. and for armor rod.

ALL BLACKBURN Connectors and Clamps for Aluminum conductor are designed to protect the conductor against crushing as well as against electrolysis. Yet these same fittings have extra gripping ability to produce a tighter and better connection, to give you years of trouble-free service. They are all made of high-strength alloys for extra strength to maintain their tightness through the years.

Always specify BLACKBURN Hi-Strength Connectors & Fittings
They'll Give You Years of Trouble-Free Service . . . Send for Samples Today

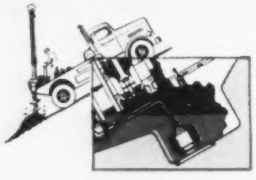
JASPER BLACKBURN CORPORATION
35 MADISON STREET • ST. LOUIS 6, MISSOURI
Phone CEntral 3007

BLACKBURN *Hi-Strength* CONNECTORS

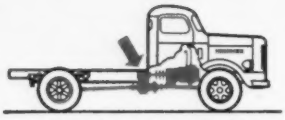
Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS HEATER

These FWD features help you speed work, cut maintenance costs!

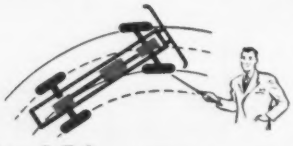
"Designed with the help of Utility men, only FWD "Mobilized Tools" offer so much value for each equipment dollar.



High-Climb Oil Sump keeps oil pump constantly submerged. An FWD exclusive that lets you bore holes, set poles on steepest grades or slopes.



Two-Speed Aux. Transmission
Doubles the number of transmission gear ratios. Provides low gear ratio for full power at extreme low speeds in tough, cross-country operations.



Full Torque P.T.O. ... Utilizes full engine power through all transmission speeds. Exclusive safety lock prevents truck drive while boring.

Fully Compensated Drive
Three free-acting differentials compensate for differences in travel of all four wheels. Reduces drive line strains, eliminates needless tire scuffing.

With extra traction and "go everywhere" mobility FWD "Mobilized Tools" for line construction or maintenance pay off for you in speed . . . to the job . . . on the job. And, you'll get all-weather service . . . greater safety for crews and equipment . . . longer, trouble-free life. When you use FWD "Mobilized Tools," you deal with only one source for service and supply.

To get the facts . . . details on the more than 78 matched-combinations utilities can choose from . . . see your FWD Dealer or write direct.

THE FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wisconsin • *Canadian Factory*: Kitchener, Ontario

Built by the makers of America's Foremost Heavy-Duty Trucks

Americans Expect to EARN what They Want!

In some countries of the world, so-called SUCCESS is acquired by FORCE; in some, it is the result of POLITICAL PREFERMENT; in others, TRICKERY is the accepted system.

In this wonderful United States of America, we expect to E A R N any confidence, respect, loyalty, friends, money and success that come our way.

YOU are our PUBLIC. We want your friendship and your business. Being Americans, we know these must be EARNED by our ability to supply you with TOP-QUALITY products—and our consistent devotion to your SERVICE.

When you need —

- **ACSR Conductors**
- **Galvanized Wire Strand**
- **ACSR Accessories**
- **Copper Wire and Cables**
- **Weatherproof Wire (Aluminum or Copper)**

Write, telephone or telegraph SOUTHERN ELECTRICAL CORPORATION.

We will tell you at once what delivery you may expect — and you can rely on us to keep our word.

We like the AMERICAN system. We will not let it — or you — down.

SOUTHERN QUALITY
MEETS EVERY TEST
Phone 7-3325

IN THE HEART OF THE SOUTH

SOUTHERN SERVICE
EXCELS THE REST
P. O. Box 989

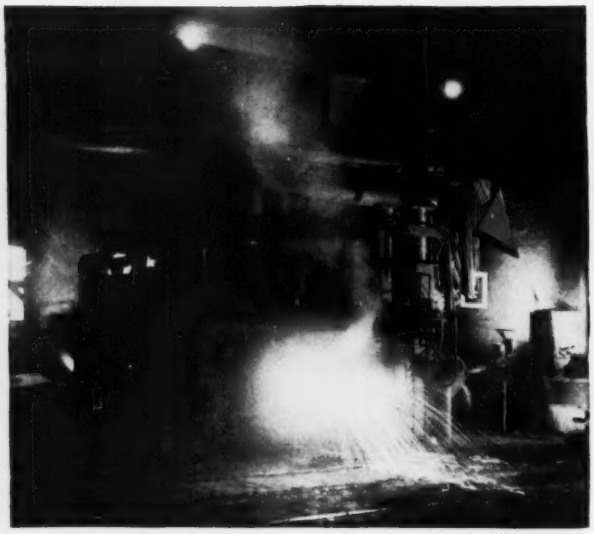
Southern Electrical Corporation

CHATTANOOGA, TENNESSEE

Pick one of these and

AMERCLAD ... *for abusive service*

You can do just about anything to Amerclad Cables. They can be soaked in acid mine water, dragged over rock, reeled in and out, exposed to sunshine. Amerclad is made in sizes to fit anything from portable appliances to 45 cu. yd. power shovels.

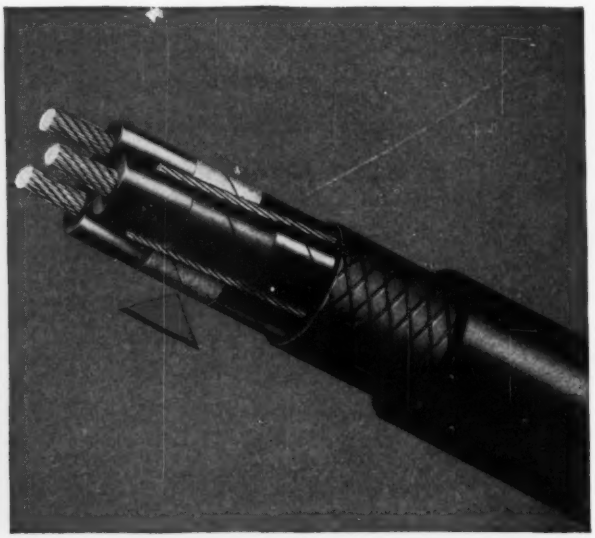


AMERBESTOS ... *for the hot spots*

When it's too hot for anything else, use Amerbestos. Our special "felted" construction enables the fibres to *stay put* even when the conductor is sharply bent. There's a full range of sizes to fit electric stoves or electric furnaces.

AMPYROL ... *for replacement wiring*

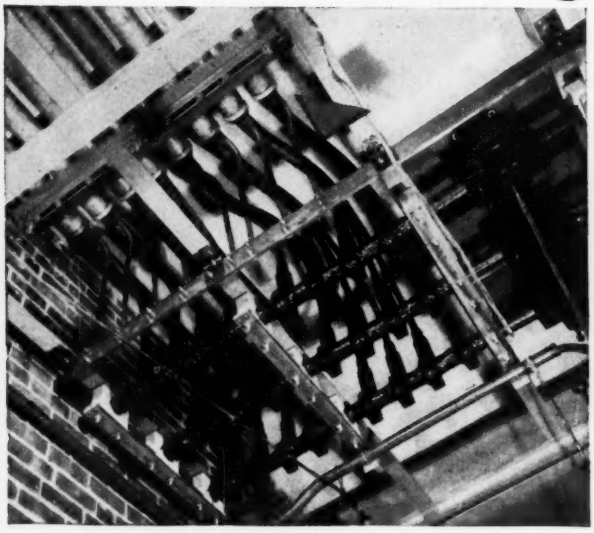
You can practically *double* the capacity of existing raceways when you rewire with Ampyrol. Six #12 Ampyrol wires can replace four #14 Type R wires. In addition, Ampyrol is easy to pull because it has a smooth, lubricated surface. For easy identification, the brilliant colors run clear through the insulation.



PS SHIELDING ... *for safety*

PS Shielding is a conducting rubber tape or compound, the original development of American Steel & Wire. It's available on all our high voltage cables to supplement or sometimes replace metallic shielding. Unlike metallic shielding, PS Shielding clings so tight that no gaps can form to cause corona discharge within the jacket. It's easy to splice and is not bulky.

you can't go wrong



VARNISHED CAMBRIC

. . . for heavy loads

Varnished cambric cables have an unexcelled combination of high dielectric strength, chemical stability (against oil and ozone) and long life at high temperatures. Also available in the form of AVC for extra heat resistance.

PAPER *. . . for high voltages*

Paper insulated, oil impregnated and lead sheathed cables are rigorously checked with a high voltage time test, dielectric power loss test and power factor test. These cables are first choice for high voltage, trouble-free service.

Choose from hundreds of types and sizes of American Electrical Wire & Cable

We'll be pleased to give you more information on any of these quality wires and cables. Or, if you have a special problem, we'll be glad to give you a complete engineering analysis and discuss the many types of special purpose wires and cables not mentioned here. Just get in touch with your nearest American Steel & Wire office or write: American Steel & Wire Division, United States Steel Company, Rockefeller Building, Cleveland 13, Ohio.

AMERICAN STEEL & WIRE DIVISION
USS TRADE MARKS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

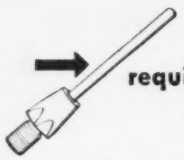
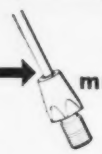
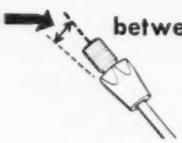
AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN ELECTRICAL WIRE & CABLE

UNITED STATES STEEL

To Reduce Your Contact Assembly Costs

Use the same specialized experience that solved this problem . . .

This tungsten electrode  **requires grinding to a tolerance of ±.00025 of an inch to insure absolute concentricity. This braze**  **must withstand the centrifugal forces of the highspeed generator in which it is mounted. The hole in the chuck** **is held to a tolerance of ±.00025 of an inch. This angle**  **between the chuck and electrode is held to within ±6 minutes of a degree.**

Originally Mallory produced only the tungsten electrode for this assembly. Another firm manufactured the chuck, and a third did the brazing and chrome plating... a complicated, costly process. Now, Mallory produces the entire assembly. The customer's problems of quality control, sub-contracting and divided responsibility are entirely eliminated . . . and his costs are lower.

This is just one more example of how many manufacturers have improved the performance and lowered the cost of contact assemblies by having Mallory do the entire job. No matter what your requirements are, Mallory's specialized production facilities . . . experience in designing and mass-producing over 5000 different types of contacts . . . can turn out precision contact assemblies for you at lower cost.

Expect more . . . Get more from **MALLORY**

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

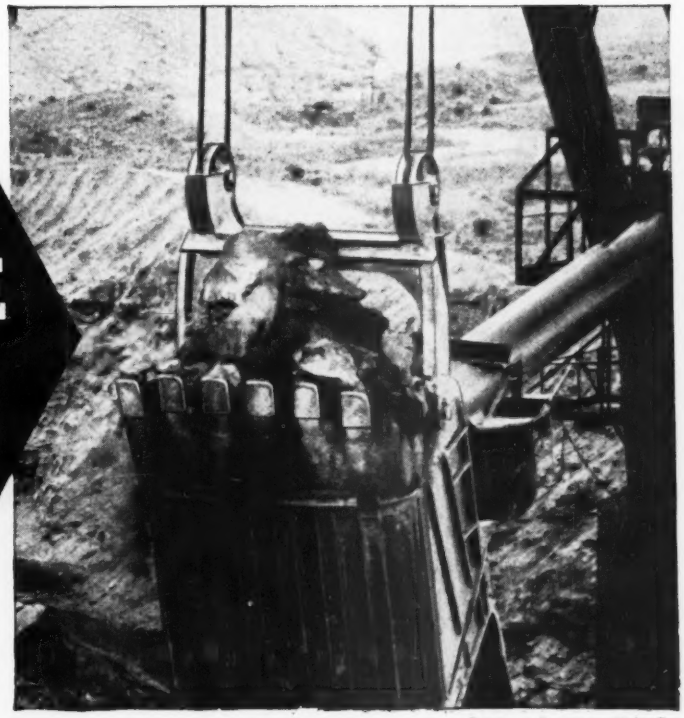
Electrical Contacts and Contact Assemblies

P.R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

PERFORMANCE HERE DEPENDS ON THIS



Courtesy Bucyrus - Erie Co.

A measure of a shovel's efficiency is the size of its bite. But of equal importance is the length of time the shovel will keep on biting. That is why the trailing cable that transmits power to the shovel should be as good as you can buy. Compared with the cost of the shovel or other material-handling equipment, the cost of the trailing cable is insignificant. Yet a breakdown in this cable can have a disastrous effect on your cost. Nothing but the best is good enough.

TIREX Cables are first-quality cables. They are engineered for tough, long-lasting service. Service records covering many years prove that they give the service expected of them.

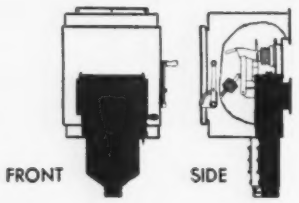
Whether the service is on a slusher hoist, a cutting machine, a continuous miner, or a stripping shovel, there is a size and type of TIREX Cable to fit every job. Whenever you need a portable cord or cable specify and be sure that you get Simplex-TIREX Cords or Cables. There are none better made.

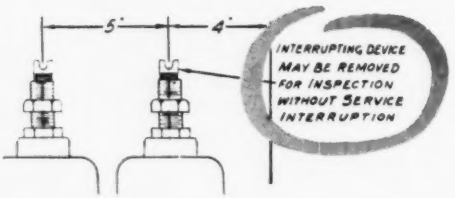
SIMPLEX TIREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

3 good reasons why 3E AIR INTERRUPTER ISOLATORS are best for transformer use

In standard procedure normal load of transformer is interrupted by an interlocked secondary breaker leaving only magnetizing current in primary circuit to be broken. The Interrupter ISOLATOR is ideal for such applications.





1 SAVES SPACE

The Air Interrupter ISOLATOR is neat and compact, occupying only one-fourth of the space required for other types of interrupting equipment.

Diagram shows space saved by superimposing a three pole, single throw, 400 ampere, 5000 volt Air Interrupter Cable ISOLATOR, with throat for transformer mounting, over equivalent air interrupter switch. Ratio is approximately 4 to 1 in favor of ISOLATOR.

2 SIMPLE TO INSTALL and MAINTAIN

Air Interrupter ISOLATORS are lighter; consequently they can be handled more easily by construction crews.

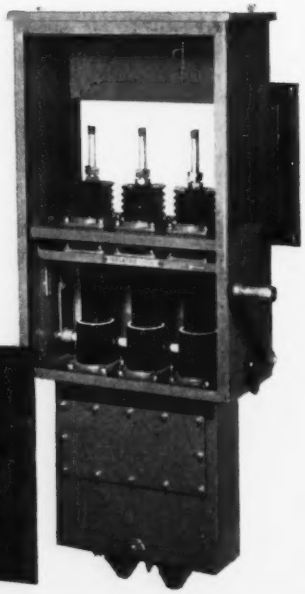
The interrupter units can be removed for inspection by means of a hot stick without clearing the circuit.

For complete data ask for new Bulletin 138.

3 ECONOMY . . . 3E PERFORMANCE EQUALS COSTLIER EQUIPMENT

The Air Interrupter ISOLATOR will provide safe interruption at much less cost than interrupter switches or other approved devices. These ISOLATORS are built for loads up to 15,000 volts . . . and their cost is surprisingly low.

CABLE ISOLATOR
3 pole, single throw
400 Ampere, 15,000 volts.



THREE E

ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK, ILLINOIS

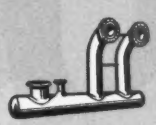
MIDWEST PIPING

is shop-fabricated piping that saves manpower

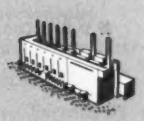
The installation of Midwest Piping requires the minimum number of man hours because the difficult operations have been performed in the fabricating plants so that field erection time is reduced to a minimum. This makes possible earlier operation of the plant. Another reason for this time saving is that every subassembly is carefully checked before shipment to make sure it is dimensionally correct and accurate in alignment. The difficulty often encountered in securing skilled mechanics for field work makes this advantage of Midwest Shop-Fabricated Piping now more important than ever before.

From A Simple Bend

Or Welded Assembly



To Complete Piping Systems For Power Plant

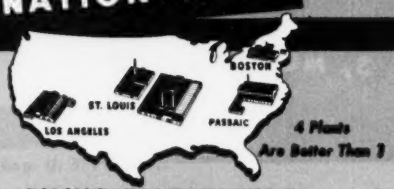


Or Process

Call On MIDWEST

4583

MIDWEST PIPING SERVICE IS NATION-WIDE

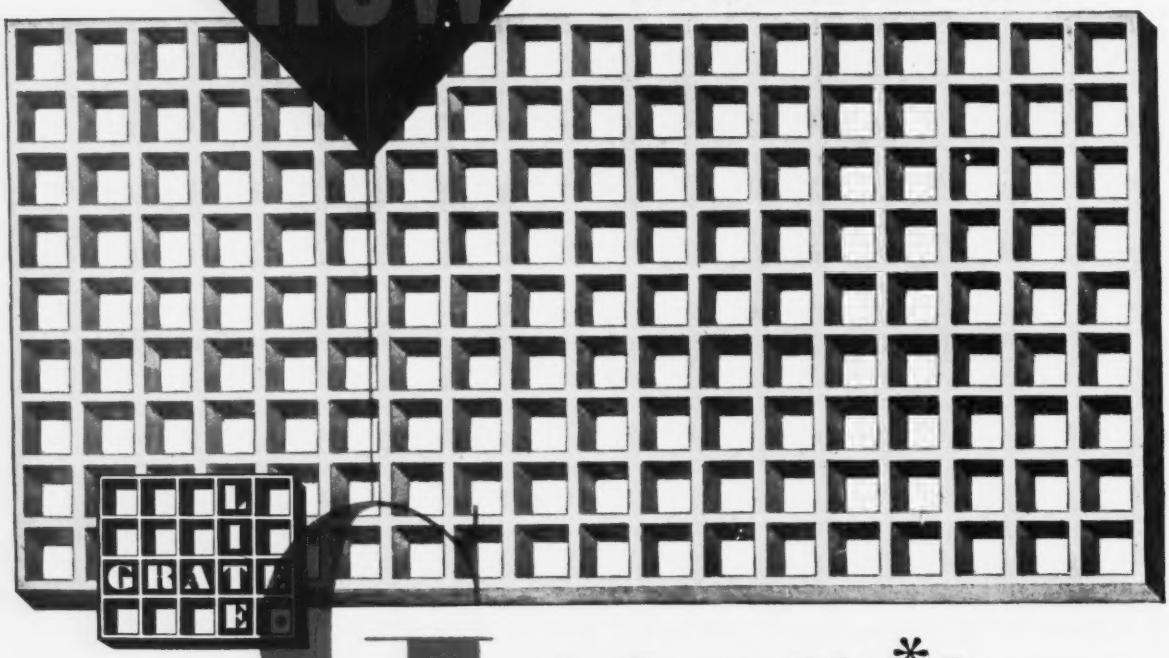


PIPING FABRICATORS AND CONTRACTORS

MIDWEST PIPING & SUPPLY CO., INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices: New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

new

OPEN LIKE A LATTICE
DIFFUSING LIKE GLASS



Guth GrateLite* Louvre

the latest idea in lighting

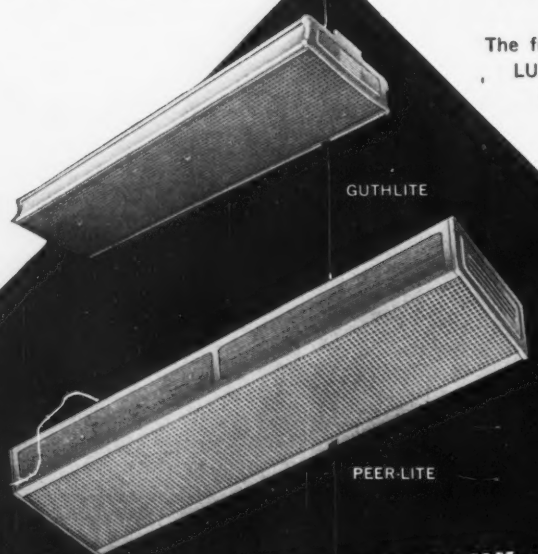
A SYMPHONY OF DIFFUSED LIGHT

*U.S. & Can. Pats. Pend.

The first integral plastic louvre for fluorescent lighting, molded of LUSTREX polystyrene. It reveals a new conception of architectural beauty and efficient lighting: Its diffusion results from the ⅜" cubical lattice that cuts off direct light at a 45° angle.

But words alone cannot describe beauty. See for yourself and ask to be shown a sample. It will give you a new outlook on lighting.

GrateLite is tough, quickly cleaned and de-staticized. It is furnished in one piece with Guth Fluorescent Fixtures.



LEADERS IN LIGHTING

Guth

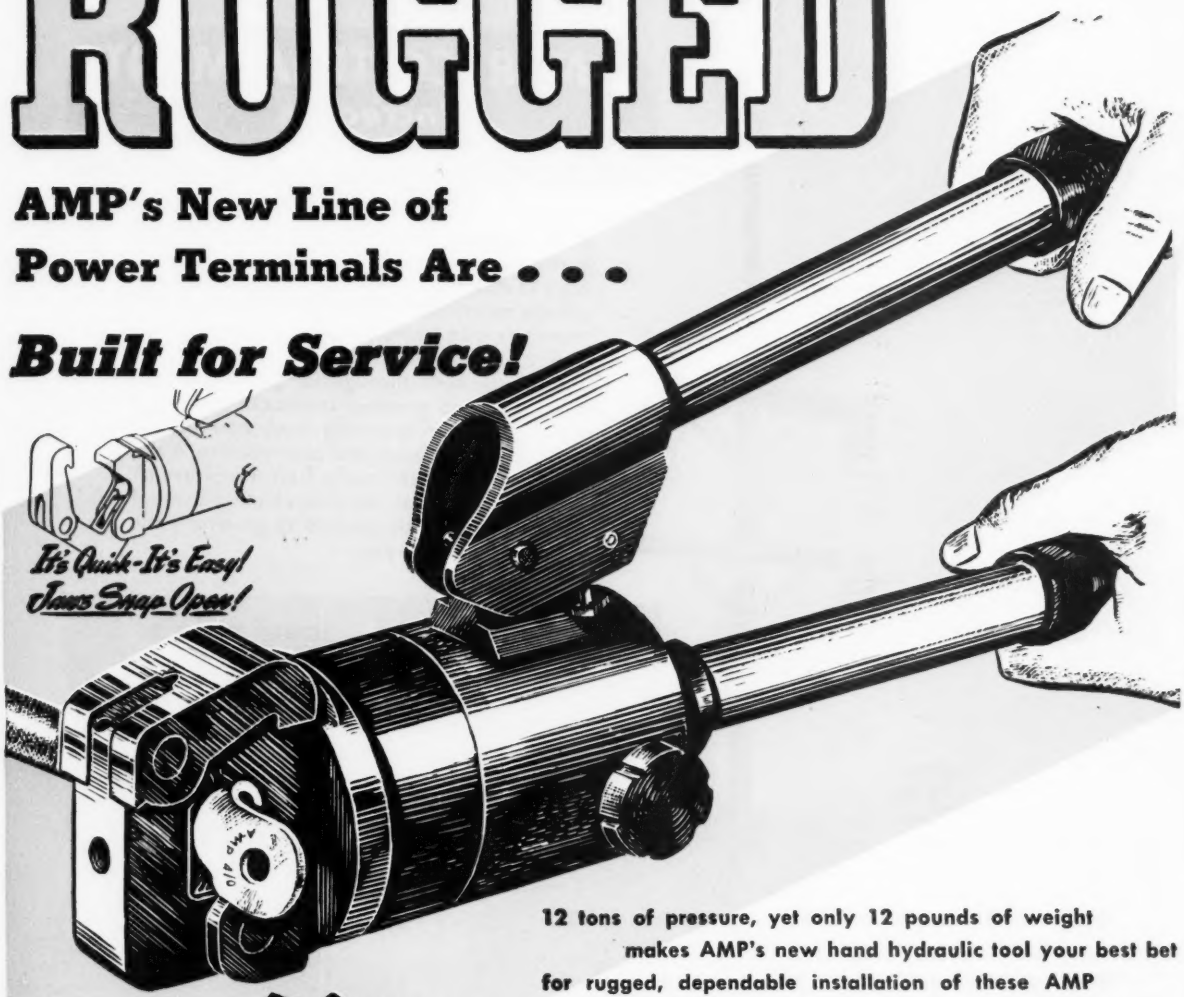
.....SINCE 1902

THE EDWIN F. GUTH COMPANY • ST. LOUIS 3, MO.

RUGGED

AMP's New Line of Power Terminals Are . . .

Built for Service!



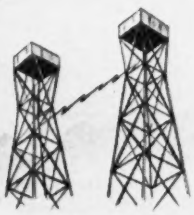
AMP Trade-Mark
Reg. U. S. Pat. Off.

12 tons of pressure, yet only 12 pounds of weight makes AMP's new hand hydraulic tool your best bet for rugged, dependable installation of these AMP *precision-engineered* power terminals. Terminals and connectors are available in all ranges from #8 to #4/0. DESIGNED FOR USE ON ALL SHAPES OF WIRE: SOLID, STRANDED, SQUARE, OVAL, OR COMBINATIONS! Dies snap in and out easily. Tool automatically releases when crimping pressure is reached. Can be used with either pole strap or bench stand if desired. WRITE FOR SPECIAL POWER TERMINAL CATALOG.

AMP

AIRCRAFT-MARINE PRODUCTS INC.
POWER TERMINAL DIVISION
1200 Paxton Street, Harrisburg, Pa.

AMCRECO TREATMENT
Increases
Pole Life Expectancy
In the last quarter of a century, through continuing research, the service life expectancy of Amcreco Creosoted products has been greatly extended. Refinements and improvements in our basic process of creosoting under pressure mean longer pole life with greater strength throughout the life of the pole. Amcreco pressure treatment has made possible longer spanning with new economies in maintenance and construction. Take advantage of our nearly half a century of experience. Any of our conveniently located sales offices will be pleased to go over your requirements with you.
AMCRECO
LOWRY PROCESS CREOSOTED PRODUCTS
POLES
PLANK
CROSSARMS
CONDUIT
AMERICAN CREOSOTING COMPANY
COLONIAL CREOSOTING COMPANY INCORPORATED
AMCREO LOWRY PROCESS CREOSOTED WOOD
GEORGIA CREOSOTING COMPANY INCORPORATED
GENERAL SALES OFFICE—CHICAGO, ILLINOIS
18 FIELD SALES OFFICES TO SERVE YOU



1922—First power line carrier current equipment installed.

1944—First application of frequency modulation to power line carrier current equipment.

1947—First microwave relay system in commercial operation.

1875—Elihu Thomson, one of the founders of General Electric, transmitted and received wireless signals for a distance of about a hundred feet.

1915—Sample radio-telephone transmitter installed on two U. S. battleships and used in 1916 Spring Naval Maneuvers.

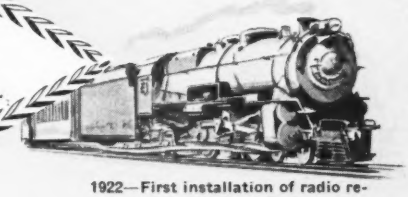
1931—Sonic locator developed for use by ships in fog. It was the first step toward radar.

1937—First application of radio communication aboard fireboats. New York City Fire Dept. installation.

1878 75 1953

YEARS OF ELECTRICAL PROGRESS

1923—First airmail plane radio communication equipment installed and tested.



1922—First installation of radio receiver aboard Pullman cars.

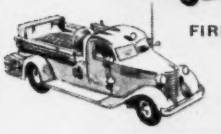
1927—First front-to-rear railroad communication equipment installed.

and today...

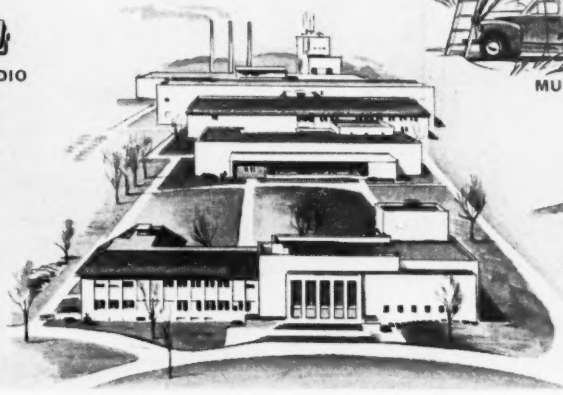
INDUSTRIAL 2-WAY RADIO

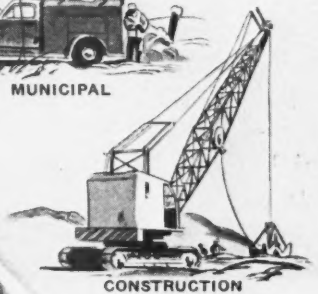
MUNICIPAL

POLICE



FIRE DEPTS.





CONSTRUCTION

Matchless Heritage IN COMMUNICATIONS ENGINEERING

From the several companies formed to manufacture Edison's historic electric lamp, G.E. is today a company with 200,000 products . . . engaged in 13 of the 21 basic manufacturing industries. Its tremendous human and material resources are constantly working to give you a better life with new and improved products.

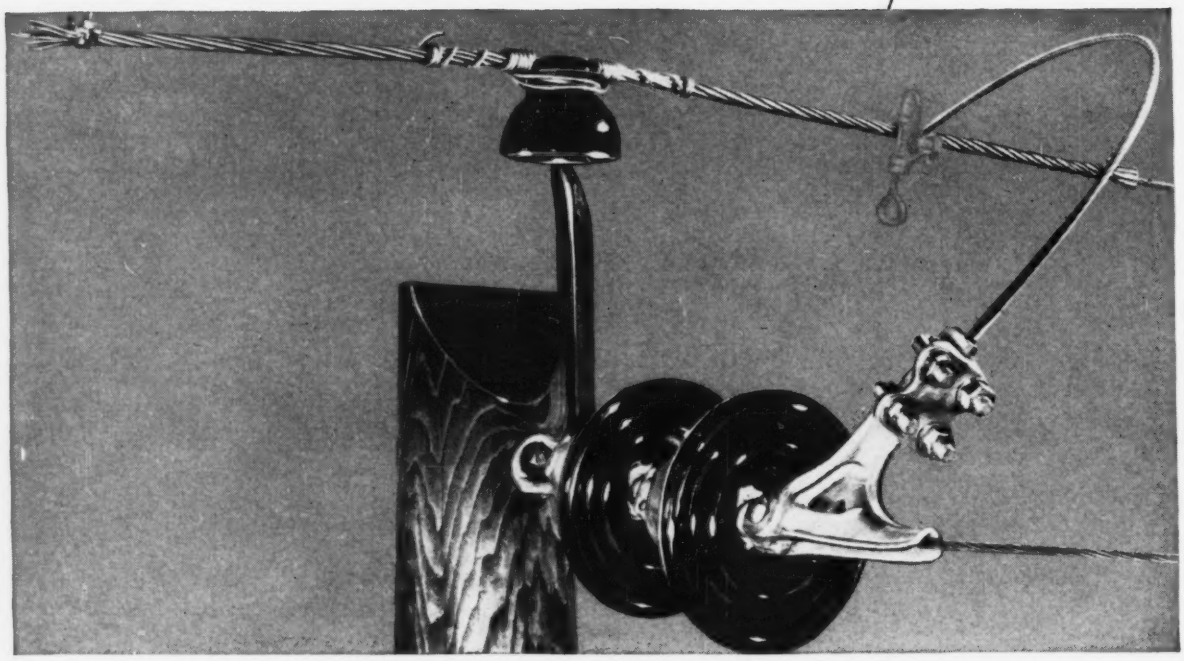
Communications in your business is the outgrowth of many G-E "firsts." Today — using G.E.'s *high-performance, low maintenance* radio units—industry, utilities, and municipal government reap these benefits: instant reliable communication for increased productivity . . . area control . . . citizen protection.

For information write: *General Electric Company, Section* **1913-26**, *Electronics Park, Syracuse, New York.*

GENERAL ELECTRIC

ACSR

and Alcoa Accessories



When you buy aluminum conductors from Alcoa, you can fill all your requirements in a single transaction—and be sure you're getting the right accessories. For Alcoa originated both aluminum conductors and accessories . . . continues to develop and improve them.

Designed for best service, there's an Alcoa accessory for every need. Alcoa backs them up with experienced design, laboratory and manufacturing facilities.

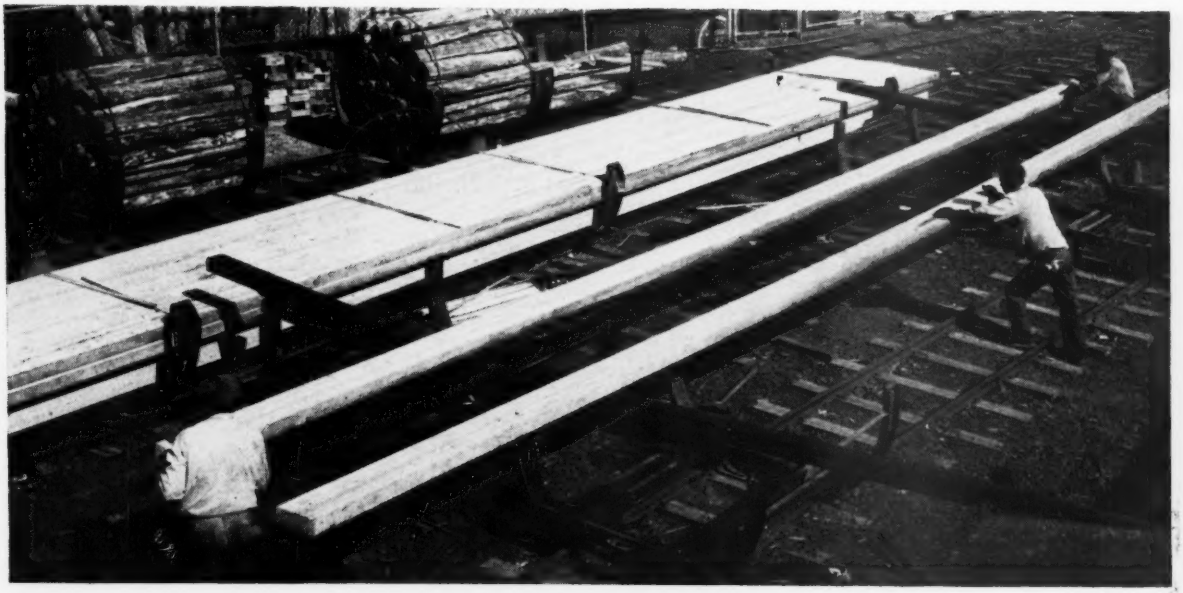
Call your Alcoa sales office for aluminum conductors *and* for accessories that are right —on the line.

ALUMINUM COMPANY OF AMERICA
2100-N Alcoa Building • Pittsburgh 19, Pa.

"SEE IT NOW" with Edward R. Murrow—CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.

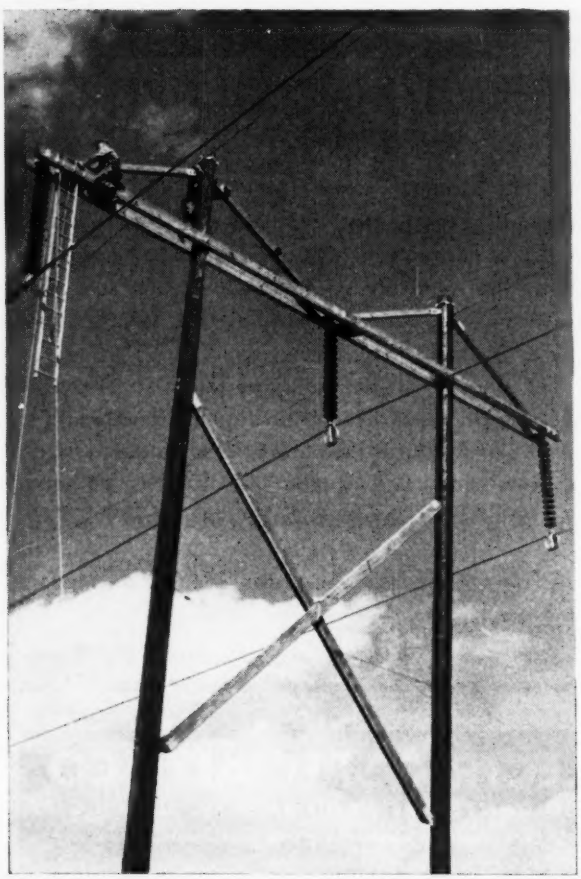
Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA



Poles and Crossarms on 136-Mile Line

PRESERVED WITH PENTA



To conserve steel and speed into operation the 938,000-kw Joppa, Illinois, generating plant being built by Electric Energy, Inc., for the AEC, wood-pole structures were used on 95% of the transmission line. All the poles were treated with penta to give them longer life, as were the huge laminated wooden crossarms, 46 to 64 feet long.

Three utilities* pooled resources to build this 136-mile, 230-kv line. It will link the systems of the companies and tie them into the new AEC Kentucky Area Project.

Monsanto Penta treatment can cut your wood replacement costs substantially. The preservative is forced deep into the wood, prevents decay, discourages completely termites and other wood-boring insects. More and more utilities are specifying penta. Penta is clean and surprisingly low in cost.

For technical information, and for the names of treating plants near you, call the nearest Monsanto office, or write us. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.

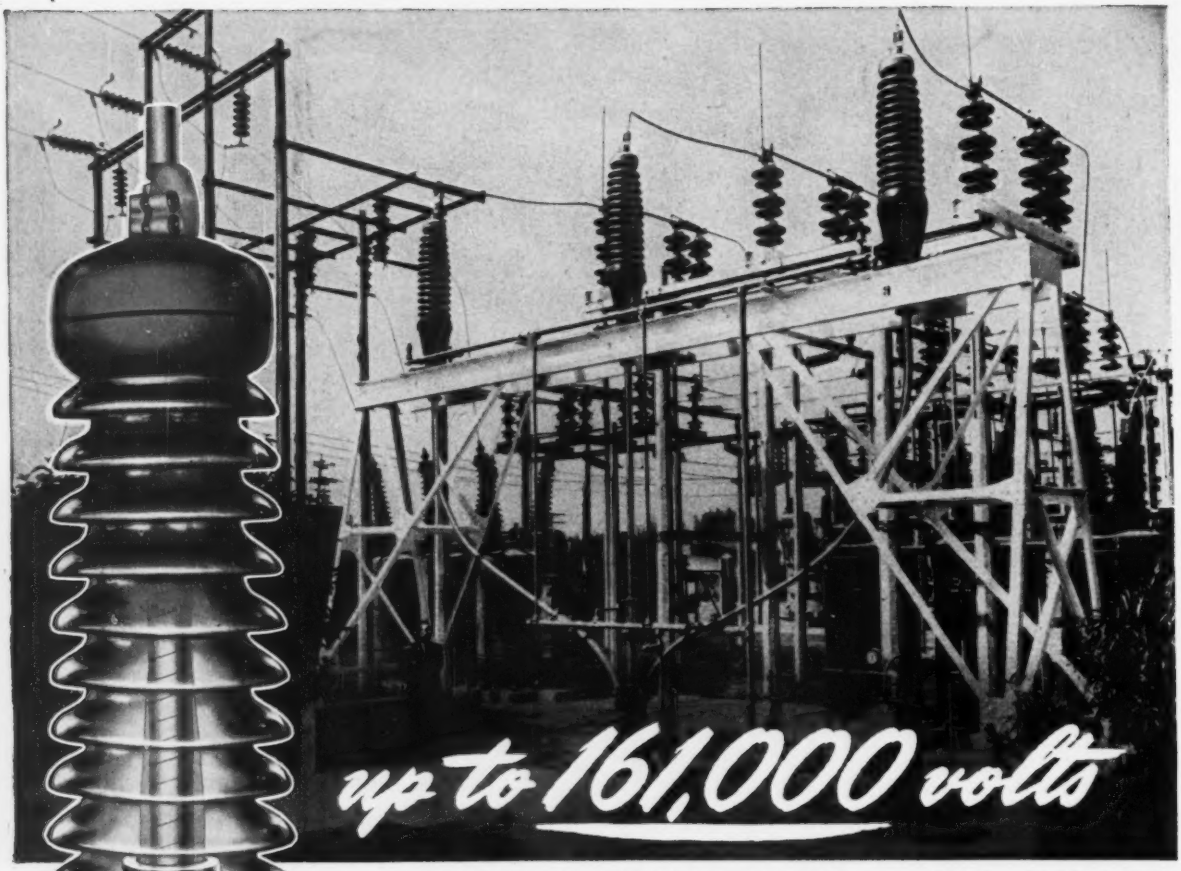
**Union Electric Company, Central Illinois Public Service Company, Illinois Power Company.*

PENTA

MONSANTO
CHEMICALS – PLASTICS

Serving Industry...Which Serves Mankind

SEND for this 16-page illustrated booklet "Specify Penta." No obligation. Write Monsanto (address above) for your copy.



HIGH PRESSURE...OIL FILLED POTHEADS by G & W

Proper treatment of mechanical and electrical stresses permit this simple G & W design. Full 200 pound pipe line oil pressure is retained by the relatively small bore porcelain shell. Top and bottom fittings are fabricated, nonmagnetic, stainless steel—sealed by a minimum of gasketed joints.

Stress relief cone, supplemented by porcelain stress control tube, makes efficient use of the internal diameter and length of porcelain shell—and reduces the amount of installation labor.

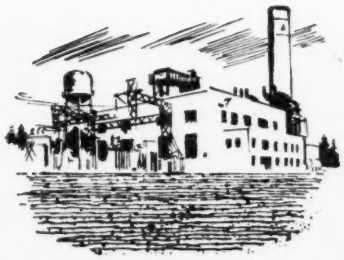
Phantom view shows G & W type "ATA" 161 kv. pothead. Background installation shows G & W type "ATA" 115 kv. potheads.

For further data, drawings and prices, send us a complete description of your cable.

G & W is now in a position to furnish Cable Joints, Oil Reservoirs, and accessories for oil and gas filled cables up to 161 Kv.

G & W ELECTRIC SPECIALTY CO.
7780 DANTE AVE., CHICAGO 19, ILL., U.S.A.
Cable terminating, connecting and sectionalizing devices
Representatives in principal cities of U. S. A. In Canada—Powerlite Devices, Ltd., Toronto and Montreal

New Powerful Weed Killer for **UTILITIES**



Du Pont CMU

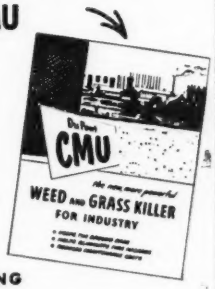
KEEPS GROUND BARE OF WEEDS AND GRASS

Small quantities of Du Pont CMU kill weeds and prevent their regrowth. CMU controls most species that are a problem around power plants, substations, pole yards and towers. A little CMU goes a long way.

- Economical, low application rates usually keep ground clear through an entire growing season or longer. As little as 40 lbs. per acre or 1 lb. per 1000 square feet often does the job.
- Kills most broad-leaved weeds and grass. Best results come with applications before weed growth starts.
- Eliminates fire hazards caused by unwanted vegetation.
- Saves labor, cuts maintenance costs. One easily applied spray takes the place of hand cutting, mowing and other methods of maintenance.
- Non-flammable, non-volatile, non-corrosive to equipment. Comes as wettable powder to mix with water.

Get This Full-Color, Illustrated Booklet Showing Results With CMU

Also tells how to use it. For your copy, use the coupon.



DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept., C-1 Wilmington, Del.

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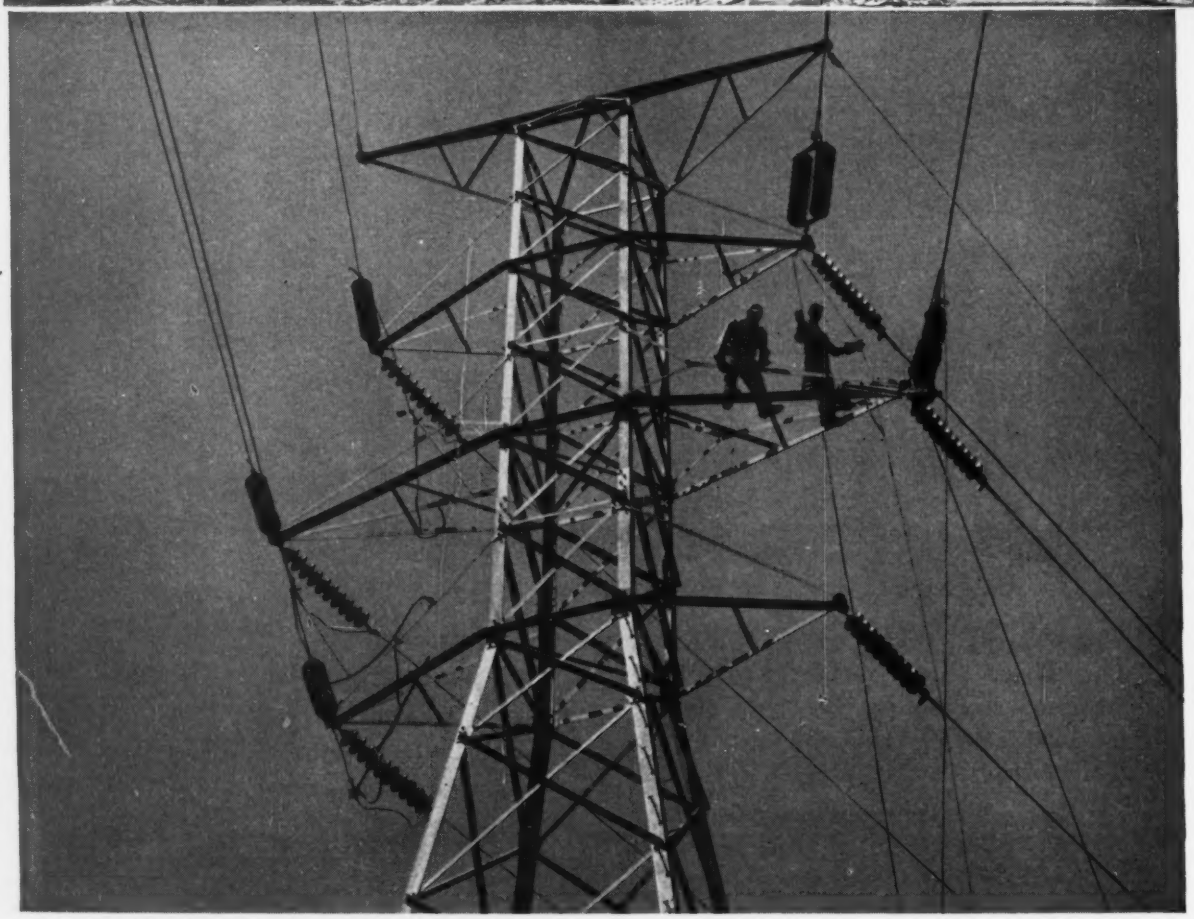
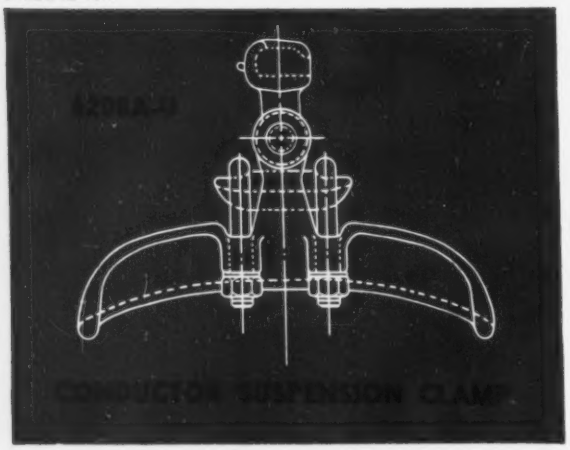
Baltimore boosts its



MEN AT WORK Linemen install 556,500 cm ACSR conductors in place of 2/0 copper transmission conductors on this two-circuit tower.

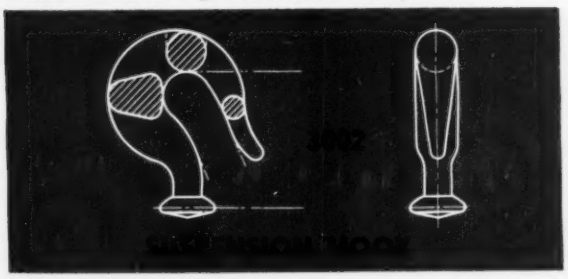


IN THE SPRING OF 1950, the Consolidated Gas Electric Light and Power Company of Baltimore began rebuilding its 110 kv ring system. This project was undertaken because studies of future load growth and planned generating facilities indicated the need for greater transmission line capacity.

THE COMPANY'S RING SYSTEM extends some 58 miles around the City of Baltimore, connecting generating stations at Westport and Riverside. Transmission conductors for the most part were 2/0 copper, with the remainder generally consisting of 4/0 copper. The Consolidated Gas Electric Light and Power Company's project called for replacement of these conductors with 556,500 cm ACSR on approximately 46 miles of line.

THE PROJECT INCLUDED the building of some 16.4 miles of additional line on right-of-way adjoining existing transmission lines. At several locations in this

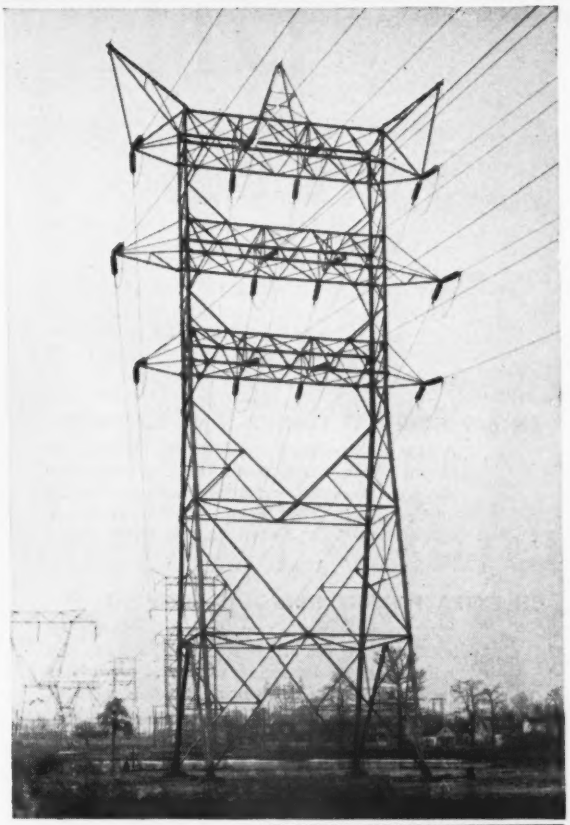
section, right-of-way limitations required the replacement of two-circuit transmission towers with four-circuit towers. This was accomplished under limited outage conditions by erecting temporary wood pole bypass lines which were operated while the two-circuit towers were replaced with the new four-circuit towers. In another section of the ring system, approximately 23.3 miles of transmission line including towers and conductors were replaced with heavier towers and ACSR conductors on the existing right-of-way. This was accomplished by installing new towers with split crossarms, after which the old towers were pulled over instead of unbolting and disassembling them.



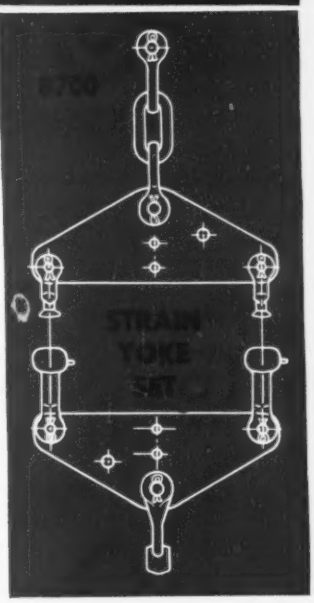
WITH THE WORK IN PROGRESS during high peak load periods and during the summer storm season, other special methods were devised to facilitate the completion of the project on schedule. In addition, transmission towers along 16.7 miles of line had to be reinforced to provide for the increased loading of the larger ACSR conductors.

Like so many major power concerns, Consolidated Gas Electric Light and Power Company of Baltimore used BTC Hi-Line Hardware on this project. Writes the company: "We have every reason to believe that its performance will be satisfactory." Specify BTC Drop Forged Clamps and Fittings for all your transmission line projects. You'll find they're easier to install . . . give trouble-free performance . . . and help hold maintenance to a minimum.

Sold through your insulator manufacturer only



PROJECT COMPLETED New four-circuit transmission towers like this replace two-circuit towers in several locations along Consolidated Gas Electric Light and Power Company's newly rebuilt 110 kv ring system.



Drop Forged* BTC *Hi-Line Hardware

***The* BREWER-TITCHENER**

Corporation

Cortland • New York

FOR BETTER ELECTRICAL INSULATION

BH TUBINGS AND SLEEVINGS

Name your insulation problem . . . there is a BH Tubing or Sleeving to solve it. Whether you're concerned with excessive current loads, vibration, extremes in temperatures, fungus resistance, or what . . . let us help you. Send us the facts on your requirements, voltages and temperatures encountered. We'll make our recommendations and send you production testing samples. Address Dept. W-1.

Bentley, Harris Manufacturing Co., Conshohocken, Pa.

BH "1151" SILICONE RUBBER FIBERGLAS TUBING AND SLEEVING

A revolutionary Fiberglas Class H (inorganic) insulation suitable for continuous operation through a temperature range of –90°F. to 400°F. No dielectric loss through handling, bending or operational stresses. Won't craze or crack when used to cover bent wire. No deterioration at high spot temperatures of 500°F. for 4 hours. Grades H-A-1 through H-C-2.

BH 649 FIBERGLAS TUBINGS AND SLEEVINGS

A superior insulation which retains its rated dielectric strength after rough handling and severe abrasion. Flexibility and other physical properties unaffected after 1500 hours at 105°C., as well as standard tests for NEMA Classes B-A-1, B-B-1 and B-C-1.

BH EXTRA FLEXIBLE FIBERGLAS SLEEVING

Comparable to single saturated (B-C-3) sleevings but completely flexible, even after exposure to heat aging, since no hardening varnish is used. Non-fraying because of patented treatment of the basic braid.

BH SPECIAL TREATED FIBERGLAS SLEEVING

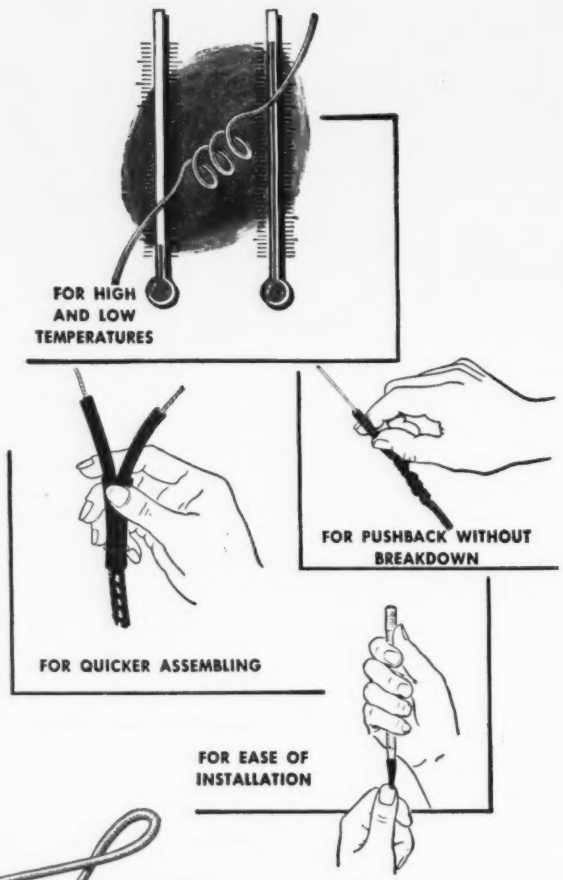
An unsaturated sleeving for temperature applications up to 1200°F. Patented process retards raveling without the use of impregnants or binders.

BEN-HAR SPECIAL TREATED FIBERGLAS TUBING

Grades A-1 and B-1, meets normal operating and baking temperatures without stiffening or cracking. Will not fray or split in handling.

BH GRADE C-3 SILICONE FIBERGLAS SLEEVING

Non-raveling and non-combustible. Working temperatures range from 400°F. to –85°F. It is moisture-proof with high leakage resistance.



BH Fiberglas* SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

TRUMBULL (T) ELECTRIC

Presents

STYLE

HCI

SIDE OPERATED

STANDARD DUTY SAFETY SWITCH

Trumbull Top Quality Features

AT 'TYPE C' PRICE

If your safety switch requirements call for normal usage and load conditions, your Trumbull wholesaler can show you a new high in value.

Check the factors that are important to you — complete safety, rapid wire-in, simplified service, compactness. You'll find them all in this new, completely Underwriters' Laboratories Approved switch line.

Inspect the pole units, the heart of any switch. They are identical with the advanced quick-break, arc-quenching design used in Trumbull heavy duty HCI switches. Notice that all current carrying parts are silver plated. Try the positive ON-OFF action. Look at the sturdy enclosure with full overlapping cover flange.

Here's assured safety and dependability in a quality switch at a price which spells economy in your purchasing . . . without resorting to "off-brand" substitutes.

Leading Electrical Distributors everywhere stock Trumbull equipment. See your local Trumbull Distributor for top values and alert service. For complete descriptive literature, write us.

Quick Facts . . .

About Style HCI Side Operated Standard Duty Service Switches

CAPACITIES: 30, 60, 100 and 200 amp., including 2- and 3-pole, 3- and 4-pole (solid neutral), and 4-pole in 30 through 100 amp., fusible and no fuse; 240, 480 and 600 volt A.C., 250 and 600 volt D.C. . . . all H.P. rated. Meets NEMA Type A Specifications.

SAFETY FEATURES: Provision for padlocking enclosure catch and handle in either position. Clear ON-OFF marking on cover and interior.

MOUNTING: Unusually compact. Can be closely ganged (200 amp. switch requires only 4½" between sides). Ring handle can be hook stick-operated if in high mounting.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

Every year...more of the nation's power flows through I-T-E Isolated Phase Bus

Bus applications growing

In 1936, I-T-E pioneered the isolated phase principle of bus design. Every year since, I-T-E Isolated Phase Bus has delivered an ever-increasing percentage of the nation's generated power. Today, about 25% of total capacity flows through I-T-E Bus. Some 35 conductor-miles—280 installations—are now in service.

Reasons for growth

Generators are getting bigger and bigger. I-T-E Bus—with each phase completely isolated from the others—is perfectly planned for carrying the heavy currents generated by these power giants.

I-T-E engineers have long experience in applying generator leads in the country's largest power projects. In both installation cost and actual performance, I-T-E has established a record for economy that is hard to match.

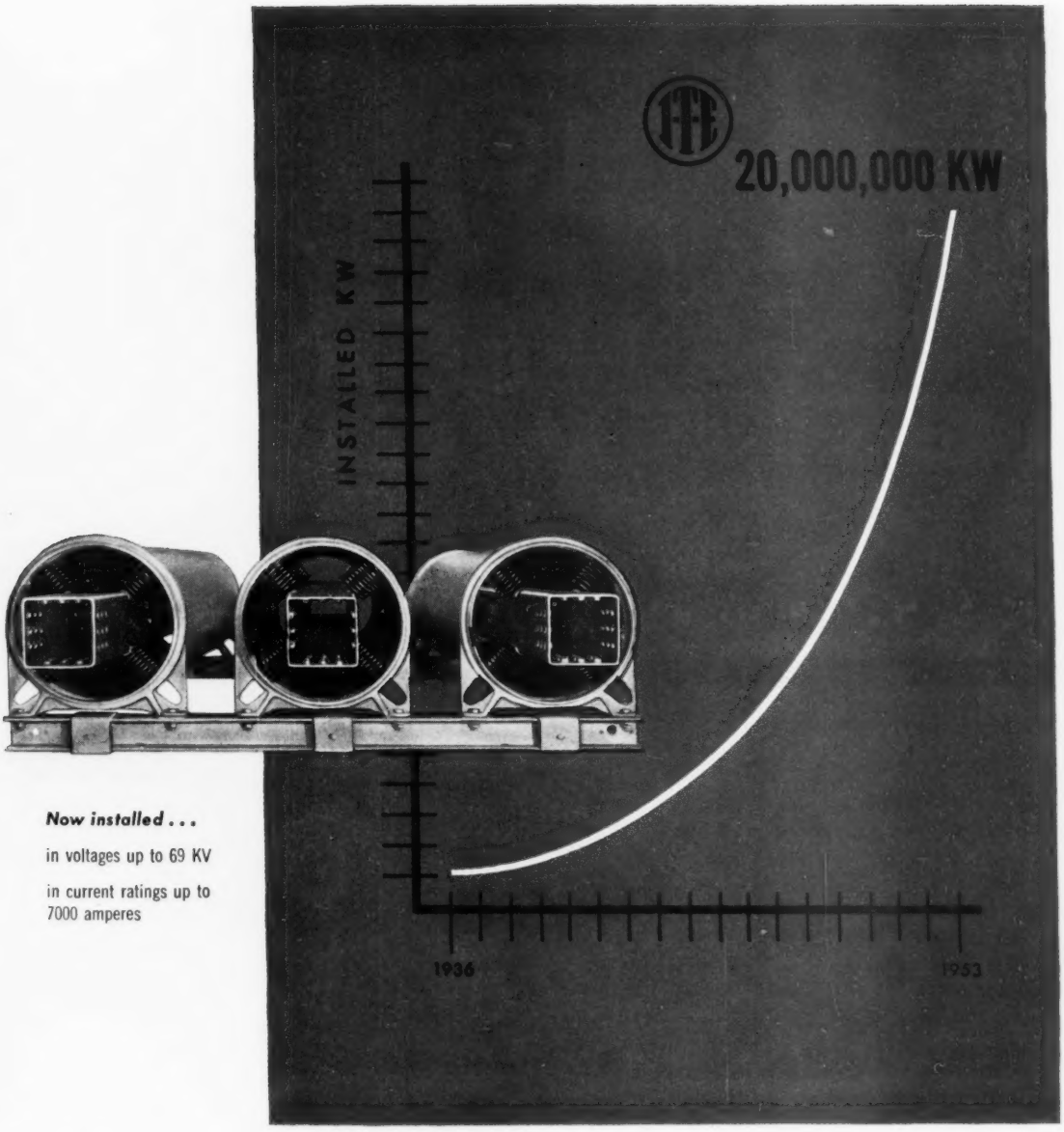
Design adaptability

Simple construction makes it easy to adapt I-T-E Isolated Phase Bus to a variety of requirements. Indoors or outdoors, on long runs or short runs, it can be readily adapted to irregular building contours. Unit-welded sections reduce installation cost on straight runs. But complicated connections—even those necessary in existing structures—are all provided for in the standard I-T-E design.

Time-tested design

I-T-E's original design has survived the test of more than fifteen years. Today, I-T-E Isolated Phase Bus has become the generally accepted design for heavy power conductors.

A tremendous power growth is forecast for the years ahead. I-T-E is prepared to meet this challenge and to serve the power industry with design experience and production capacity.



Now installed . . .

in voltages up to 69 KV

in current ratings up to 7000 amperes

I-T-E ISOLATED PHASE BUS

I-T-E CIRCUIT BREAKER COMPANY • 19th & Hamilton Sts., Philadelphia 30, Pa.

R&IE R&IE EQUIPMENT DIVISION, Greensburg, Pa.

LAPP PORCELAIN

IS YOUR GUARANTEE

OF LONG INSULATOR LIFE

Insulator life depends on soundness of porcelain, and assembly which gives it the best chance to live. For greatest insulator serviceability, look to the quality of the porcelain, and to assembly which recognizes the physical characteristics of the porcelain. Nowhere have these two requirements been the subject of more study, nor the object of more production care than at Lapp. The Lapp reputation for porcelain quality is ample basis for your confidence in the specification *"Lapp Suspension Insulators."*

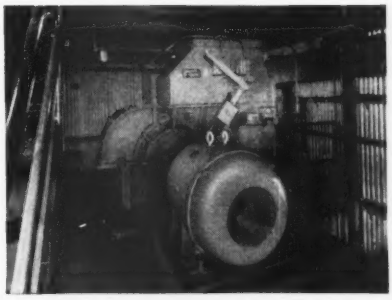
Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK

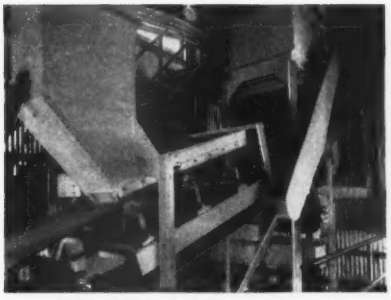
General View of Bay Front Steam Plant
Lake Superior District Power Co.
Sargent and Lundy
Consulting Engineers

Bartlett-Snow coal handling at Ashland

● The illustration above shows the first 38,600 KW unit of a plant which is to be extended into a 60,200 KW station. Coal is received by lake boat at a near-by deep water dock, and carried to the plant in railroad cars. All handling facilities including the track hopper and grillage, duplex feeder, conveyors, gallery, chutes, tripper and all supporting structures, were fabricated in our shops and installed by our erectors to Sargent and Lundy specifications. For maximum efficiency and fixed unit responsibility, let the Bartlett-Snow coal handling engineers work with you on your next job.



150 Ton Per Hour Ring Roll Crusher
Showing By-Pass Gate and Drive



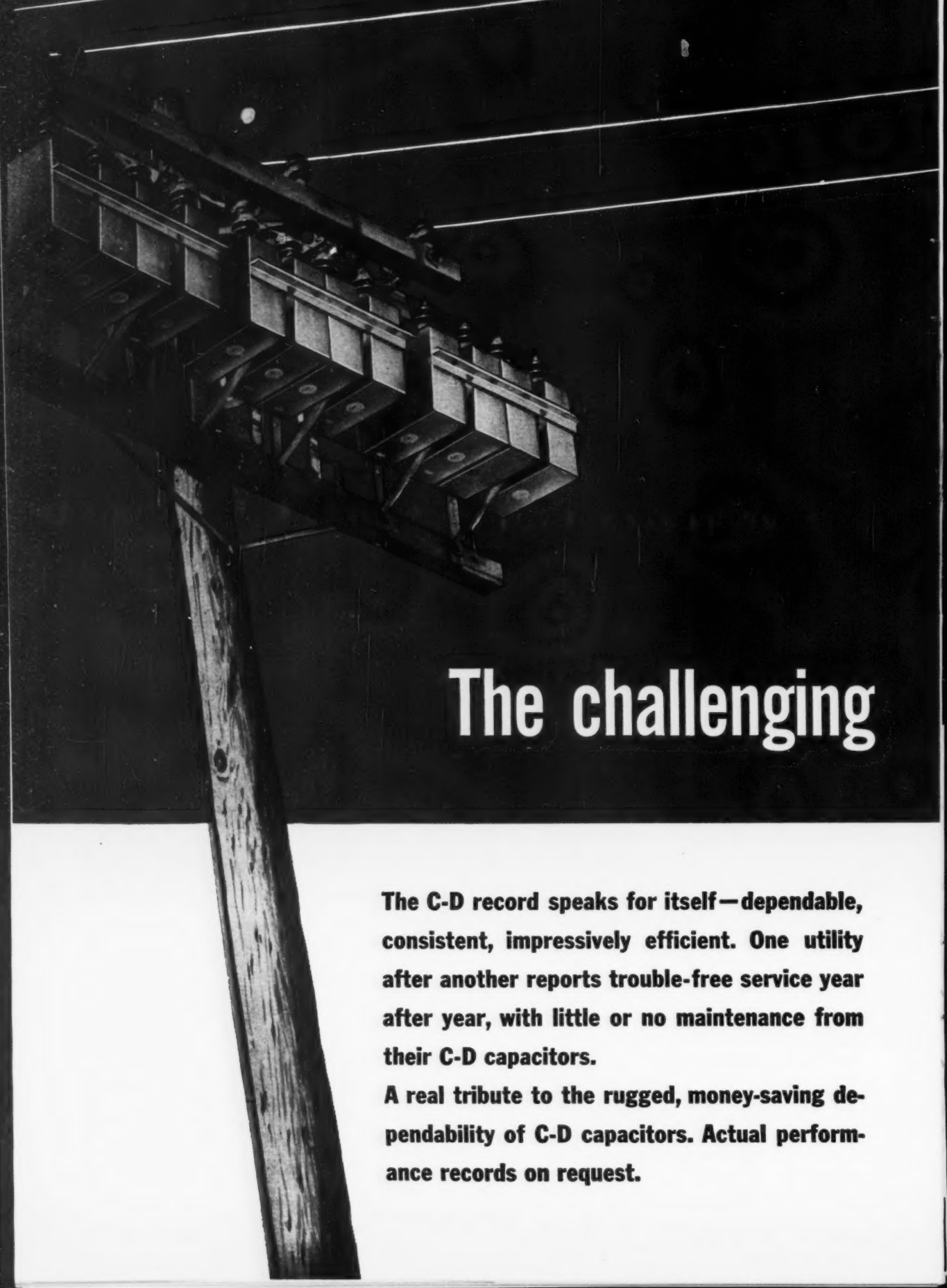
Belt Conveyor Showing Automatic
Weightometer and Vertical Take-up

DESIGNERS ENGINEERS

BARTLETT-SNOW
CLEVELAND 5, OHIO

FABRICATORS ERECTORS

"Builders of Equipment for People You Know"



The challenging

The C-D record speaks for itself—dependable, consistent, impressively efficient. One utility after another reports trouble-free service year after year, with little or no maintenance from their C-D capacitors.

A real tribute to the rugged, money-saving dependability of C-D capacitors. Actual performance records on request.

performance of C-D capacitors

These exclusive C-D features mean more value for your capacitor dollar:

- Case SAND-BLASTED for longer-lasting finish
- Solderless service connector
- Heavy-duty wet process porcelain bushings for longer creepage path, less breakage, higher impulse rating
- Wide margin between paper and foil provides higher impulse level
- Capacitor impregnated and case filled with non-inflammable, non-explosive Dykanol
- Use of C-D's Dykanol results in lower unit weight per Kvar; high stability; long life
- Many small sections in series-parallel results in low voltage gradient; no corona; lowest dielectric unit stress
- Only C-D capacitors (from 230 to 13,800 volts), are tested at full rated voltage for a period sufficient to establish ultimate heat rise

If you are considering an installation of industrial, station or pole-type capacitors for power-factor improvement, you can save maintenance dollars by talking it over with a C-D engineer. Cornell-Dubilier Electric Corp., Dept. D-13, South Plainfield, N. J.

1910-1953

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO

SPECIFICATION SHEET

THESE ARE THE REASONS FOR SPECIFYING ORANGEBURG FIBRE CONDUIT:

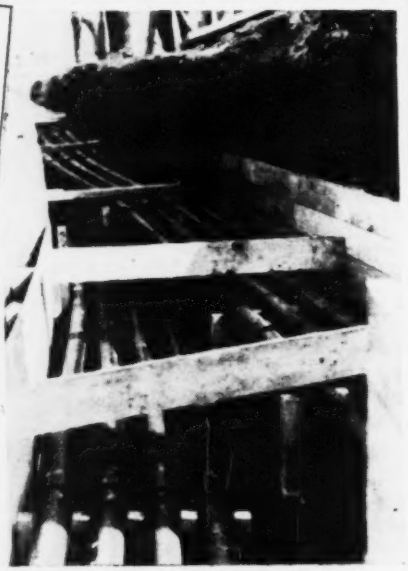
- ☆ Lasts indefinitely.
- ★ Impermeable wall.
- ★ Lays faster and at lower cost than any other type of conduit.
- ★ Low coefficient of friction.
- ★ Resists acids, alkalies, salt, grease, oil.
- ★ Light and easy to handle.
- ★ Easy to tool on the job.
- ★ Tough and resilient — it does not crack or break when properly handled.
- ★ Orangeburg is a leader in every city and state.

Write to Dept. EW-1 for complete catalog.
Orangeburg Manufacturing Co., Inc., Orangeburg, New York

ORANGEBURG® FIBRE CONDUIT

STANDARD with concrete
NOCRETE without concrete

NOCRETE INSTALLED WITHOUT CONCRETE ENCASEMENT



STANDARD INSTALLED WITH CONCRETE ENCASEMENT

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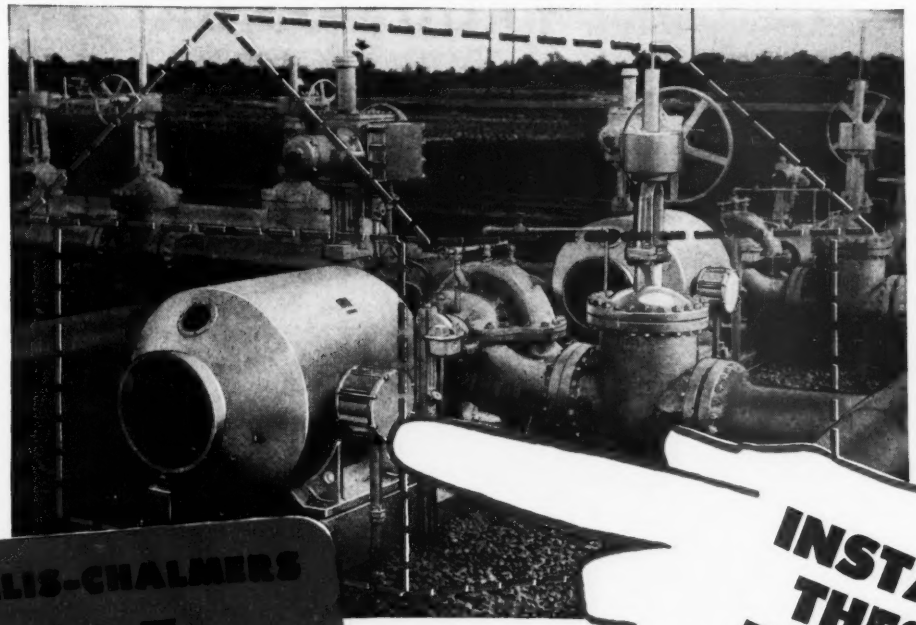
No building to buy!



ALLIS-CHALMERS
Tube-Type
TEFC MOTORS

INSTALL THESE MOTORS OUTDOORS

YOU CAN ELIMINATE costly building on many different kinds of installations by using Allis-Chalmers tube-type, totally-enclosed, fan-cooled motors and installing them outdoors. The motors shown here operate outdoors all year round in a tough midwestern climate. Rain, snow, dirt, the weather's worst conditions, do not affect their dependable operation. And the same kind of savings can be made in hundreds of applications in many fields.

Self-Cleaning Feature Saves Maintenance

The cooling system in this unique motor is practically self-cleaning. Cooling air is blown through straight, smooth tubes at sufficient velocity to clean out ordinary dirt. There are no corners or pockets to trap dirt or moisture. If sticky dirt clings, a ramrod will clean the tubes in seconds.

In either indoor or outdoor service, Allis-Chalmers tube-type, totally-enclosed, fan-cooled motors reduce maintenance by keeping themselves clean. *Also available in explosion-proof design.* Get full details from your A-C Authorized Distributor or District Office. Or write Allis-Chalmers, Milwaukee 1, Wis., asking for bulletin 51B7149.

A-3903

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

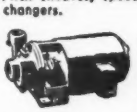
ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

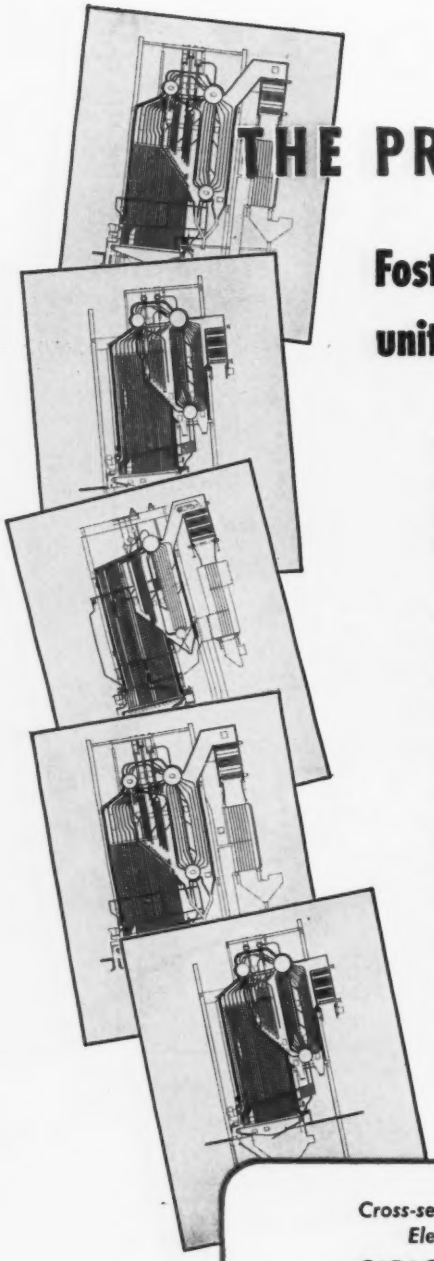
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.



THE PROOF OF SATISFACTION

Foster Wheeler installs 18 spreader-stoker units for six customers!

The surest proof of customer satisfaction for any product is a repeat order. And on major equipment, such as steam generators, customer acceptance means satisfaction from planning through actual operation.

That's why Foster Wheeler is proud of this record of repeat installations of versatile spreader-stoker-fired units with their capability of burning a wide variety of bituminous coals. Installations up to 325,000 lbs per hour have been made for:

CENTRAL ILLINOIS ELECTRIC and GAS CO.	5 UNITS
CENTRAL IOWA POWER COOPERATIVE	2 UNITS
MONSANTO CHEMICAL CO.	4 UNITS
NORTHERN STATES POWER CO.	2 UNITS
STUDEBAKER CORPORATION	3 UNITS
WEST VIRGINIA PULP and PAPER CO.	2 UNITS

These installations are another example of Foster Wheeler's ability to design, engineer, fabricate and construct power-producing equipment to meet your needs.

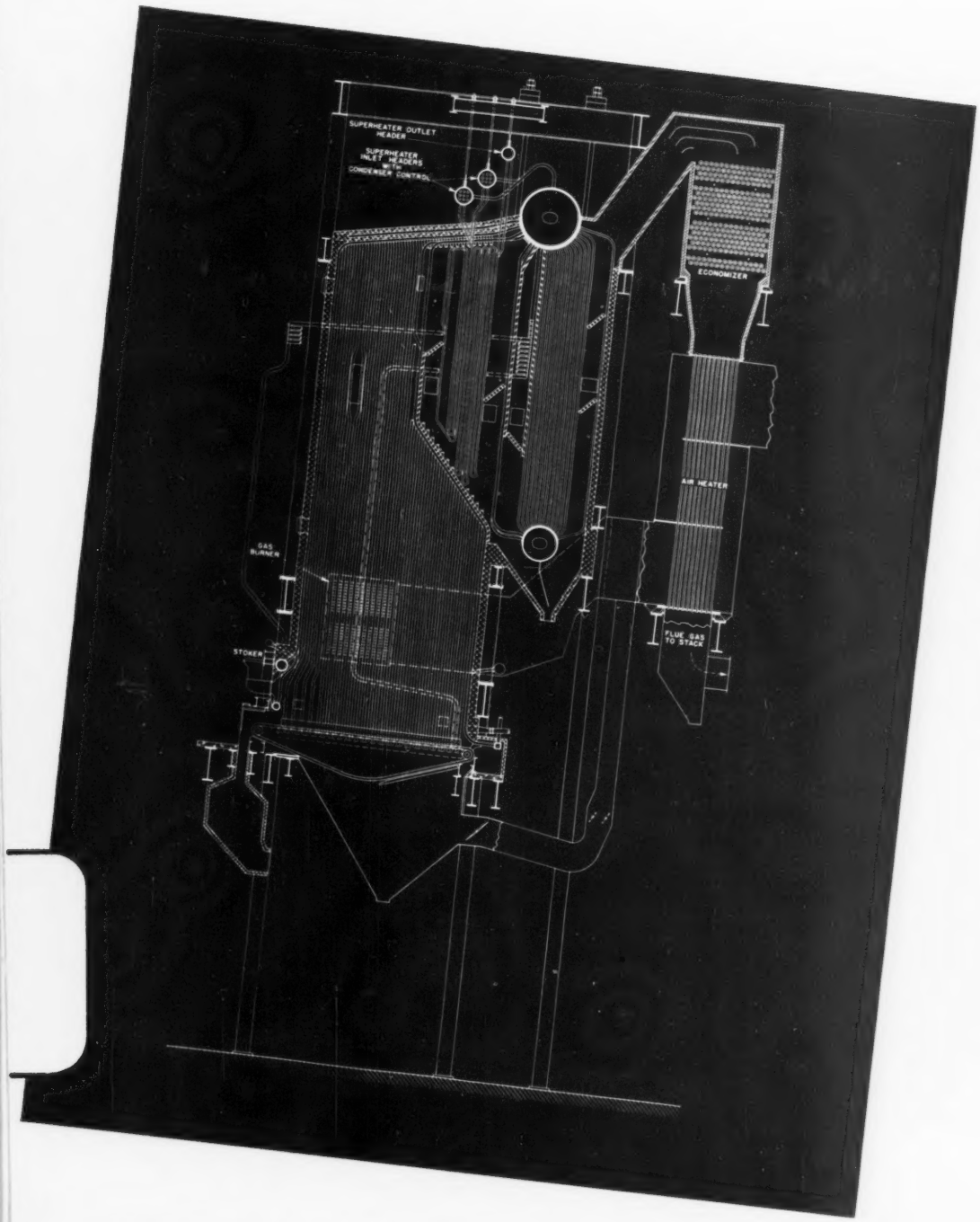
Cross-section of latest stoker-fired steam generator designed for Central Illinois Electric and Gas Co., Sabrooke Generating Station, Rockford, Illinois.

CAPACITY	300,000 lb per hr
PRESSURE	950 psig
FINAL STEAM TEMPERATURE	875 F
FEED TEMPERATURE	350 F

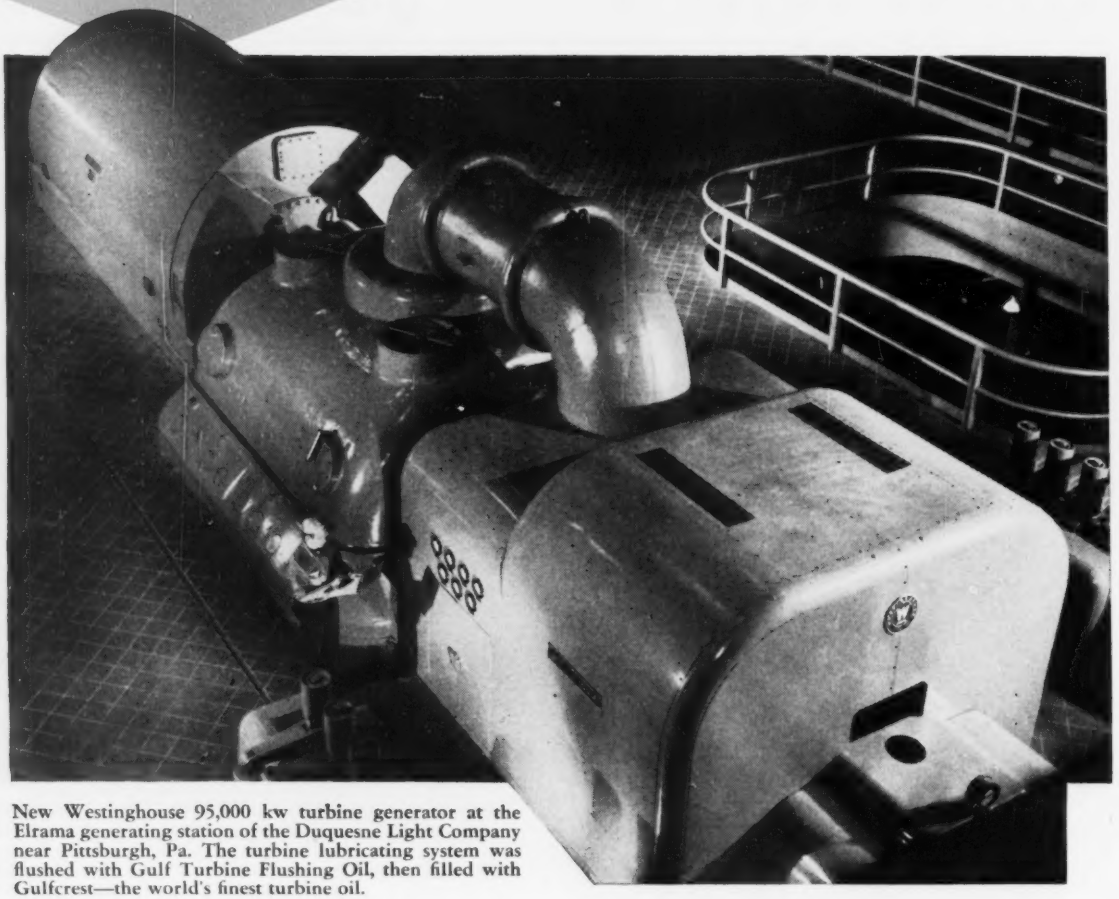
FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

...REPEAT ORDERS!



GULFCREST OIL selected for another big turbine-95000 kw



New Westinghouse 95,000 kw turbine generator at the Elrama generating station of the Duquesne Light Company near Pittsburgh, Pa. The turbine lubricating system was flushed with Gulf Turbine Flushing Oil, then filled with Gulfcrest—the world's finest turbine oil.

Another outstanding new turbine generator gets the safe, sure, long-lasting protection of Gulfcrest Oil.

And here's another prominent utility which has selected Gulfcrest Oil on the basis of previous successful experience with this outstanding turbine lubricant.

The important reason: Because of its exceptional resistance to oxidation, Gulfcrest maintains an exceptionally low neutralization number and lasts indefinitely in service.

For additional information on this outstanding turbine oil, call in a Gulf Sales Engineer. Write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION · GULF REFINING COMPANY
PITTSBURGH 30, PENNSYLVANIA

GULF INDUSTRIAL LUBRICATION

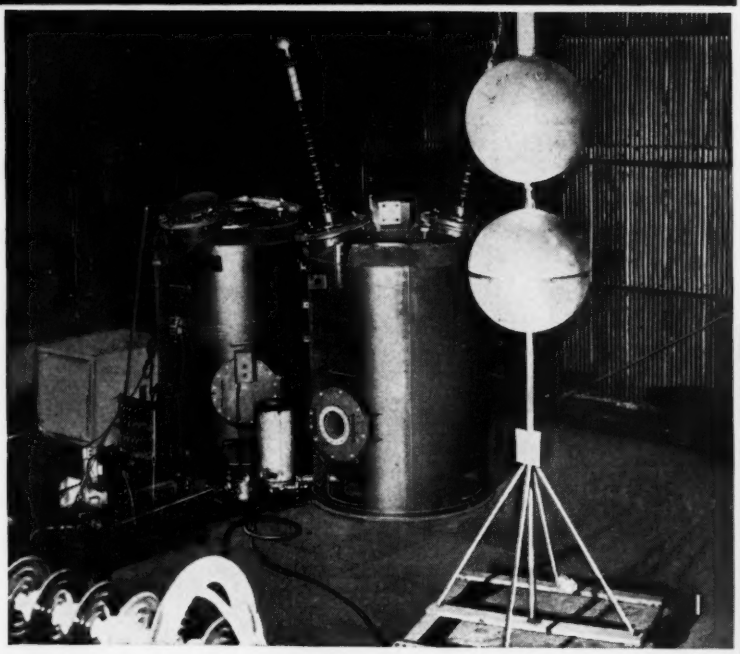
x = Manufacturer's Tests

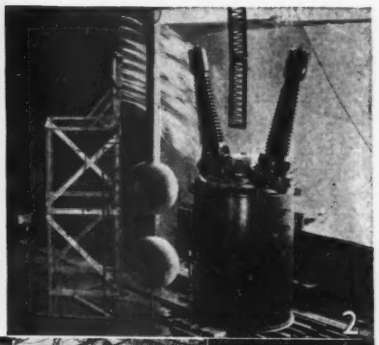
$f(x,y,z)$ = Protective Performance

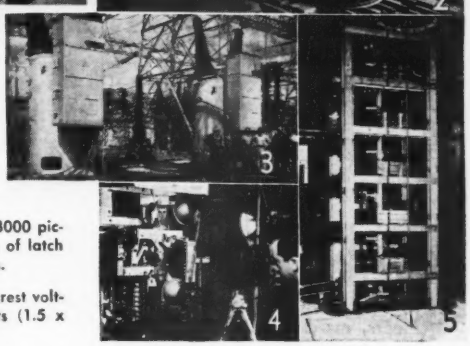
PACIFIC ELECTRIC

OIL CIRCUIT BREAKERS

embody the "X" factor to a high degree







PACIFIC'S TEST PROGRAM IN ACTION

is partially shown by these views

1. Pole Unit of 161-kv, 10,000,000 kva, Type RHE withstands 365 rms kv, 60-cycle.
2. Pole Unit of 230-kv Type RHE withstands 445 rms kv, 60-cycle, under water spray of wet test.
3. An at-site setup for field test of interrupting rating, using two units at 230 kv. Interruptions to 9,600,000 kva (ASA) at 240 kv were obtained—the maximum from the generating facilities available.
4. High-speed camera, making 3000 pictures per sec, records motion of latch linkage during design studies.
5. Impulse Generator used for crest voltage tests to two-million volts (1.5 x 40-ms wave).

CIRCUIT BREAKER Performance is a function of several factors, of which the manufacturer's test program is but one. However, this "x-factor," as some call it, deserves as much attention when selecting circuit breakers as does any of the tangibles.

Pacific Electric's facilities and arrangements for testing, and their use by trained test personnel, have contributed significantly to the reputation that Pacific breakers enjoy among today's application engineers.

Design tests cover such matters as insulation withstand (60-cycle and impulse), interrupting time and current, momentary and 4-sec high currents, the continuous-current heat run, and check of mechanical features (the 5000-operation design test).

Noteworthy is Pacific's policy of field testing at locations where maximum interrupting current may be obtained at full voltage and high recovery rates. Seven such field test programs have been completed during the last five years; they avoid need of extrapolating from laboratory tests in which one or more of the elements may be missing.

Since 1906

SALES OFFICES or AGENCIES in PRINCIPAL CITIES

PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • 4500 HARRISON STREET, GARY 10, INDIANA

"We get CONSISTENTLY EXCELLENT RESULTS with D-H ALLOYS"

... *says Resistance Products Company, of Harrisburg, Pennsylvania*

This company produces precision wire-wound resistors of utmost stability for electronic equipment used by the Armed Forces and for makers and users of test instruments, meters, and scientific apparatus of various types. The vital accuracy of much important equipment, therefore, is very dependent upon the quality of the resistors coming off the production lines of Resistance Products Company.

In view of this, Driver-Harris is particularly gratified to have Resistance Products state: "Reflecting our experience with Driver-Harris alloys is our large use of Karma wire. Currently, we are employing Karma for numerous critical applications where utmost stability, together with high resistivity and low temperature coefficient of resistance, is requisite. *Consistently excellent results* are being obtained. We have, in fact, used Karma with outstanding success ever since its introduction several years ago. It is our belief the development of this alloy constitutes a major forward step."

Karma* is ready to serve you, too; as are world-famous Nichrome* and Nichrome V, and over 80 other alloys developed by Driver-Harris for the electrical and electronic industries. We feel confident that, like Resistance Products Company, you'll realize exceptional advantages by putting one or more D-H alloys to work for you. Let us have your specifications. We'll gladly make recommendations based on your specific needs and have our engineering department help you obtain best results.

KARMA* and world-famous Nichrome*
are manufactured only by

Driver-Harris Company
HARRISON, NEW JERSEY

BRANCHES: Chicago, Detroit, Cleveland, Los Angeles, San Francisco
In Canada: The B. GREENING WIRE COMPANY, Ltd., Hamilton, Ontario.

*T.M. Reg. U. S. Pat. Off.

MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

JUST OFF THE PRESS--

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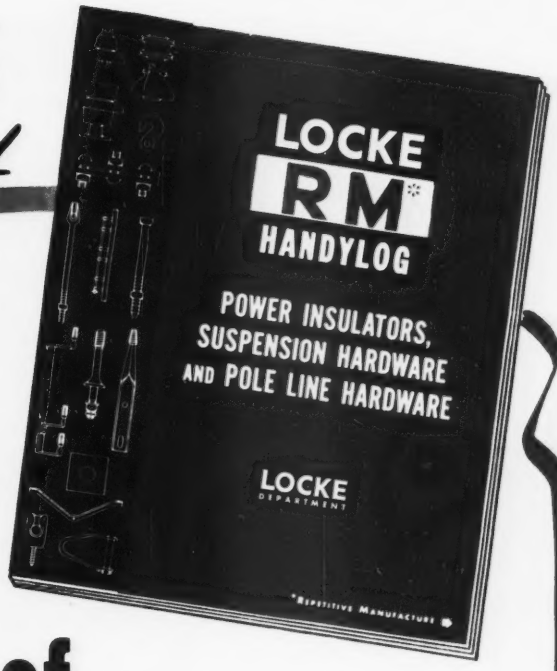
2nd edition of

LOCKE'S RM* HANDYLOG of insulators and pole line hardware



This new revised edition lists . . . in 72 pages . . . ALL the pole line hardware, as well as ALL the power insulators and suspension hardware you need for handling over 95% of your jobs. Mail coupon today for your free copy. Place the RM* items on your standards list . . . and you'll benefit five ways:

1. **YOU SIMPLIFY** stocks and stocking operations.
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***RM (Repetitive Manufacture)**
A program designed to help reduce the installed cost per kilowatt on line and station equipment.

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Please send me my copy of Locke's new RM* Handylog.

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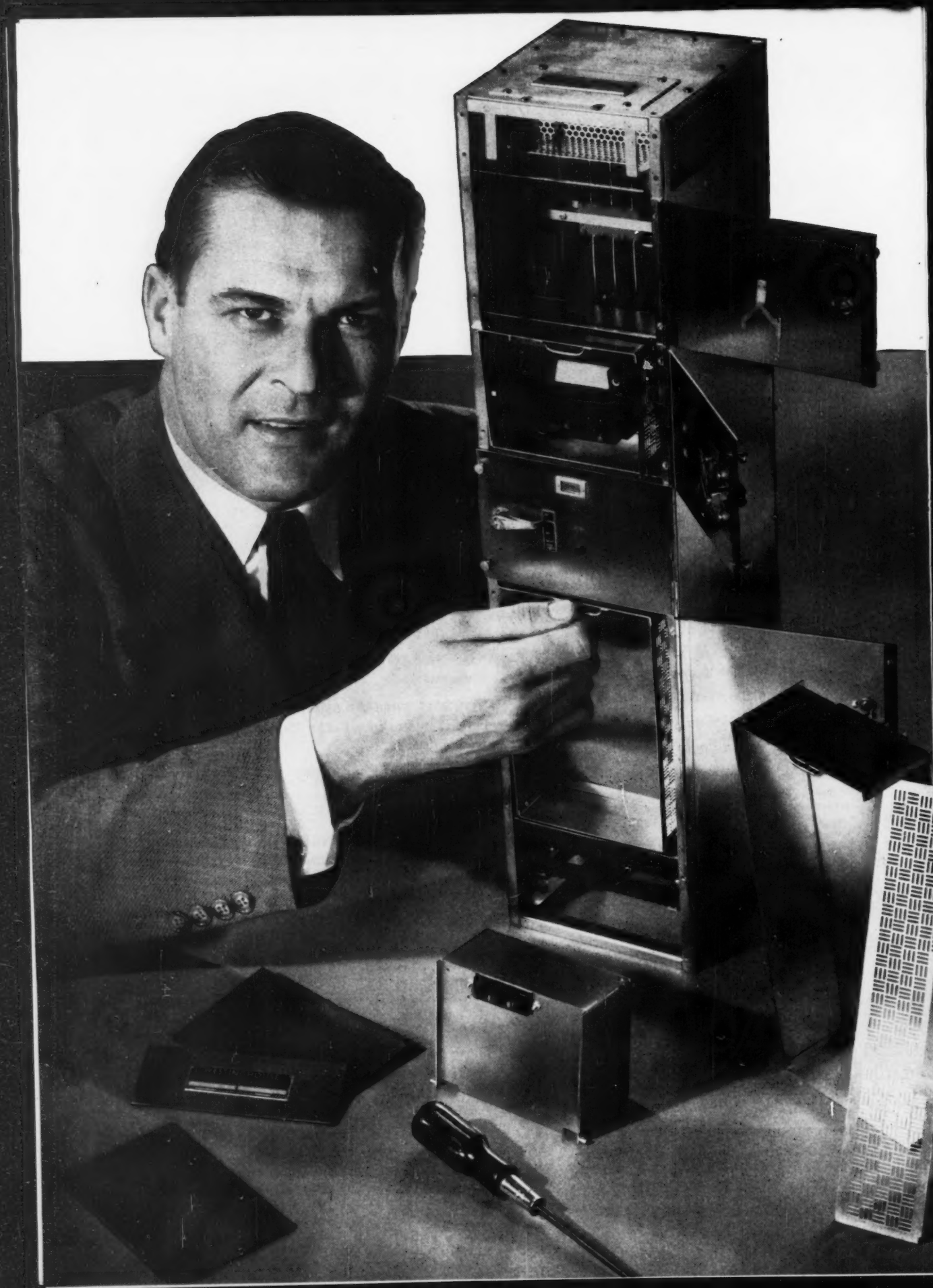


Here's why most control center buyers specify Westinghouse

Why this mass preference? It all boils down to matching product to need. Close co-operation with industry, exhaustive tests and constant improvement have produced this control center which matches industry's every need. Here are the product features that make Westinghouse Control Centers the MOST PREFERRED control centers:

FLEXIBILITY

Westinghouse Control Centers have complete flexibility to match the periodic movement, substitution and addition of machines—flexibility of electrical components—flexibility of structural units. All cubicle units are built to a standard 14″ module—are completely interchangeable. Vertical structures are standardized and free-standing—can be moved or added at any time.

EASIER SERVICING

There is no maze of mechanical obstacles on a Westinghouse Control Center. A few twists of a screw driver and your serviceman is ready to go to work. Guide rails simplify removal and insertion of cubicles. All starter units are front wired. Side baffles are removable for easier wiring. Sectional and master terminal boards speed hook-up work.

POSITIVE SAFETY

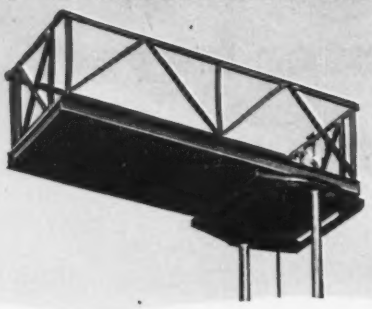
Westinghouse Control Centers protect *both* personnel and equipment. The Westinghouse "Magnagrip®" stab connectors and tilt-out disconnect position assure a "dead" unit for servicing. Unit door remains on structure to cover hot buses when starter unit is removed. Tested baffling prevents explosive chain reactions if faults occur. Each starter has an interrupting capacity of not less than 15,000 rms amps.

Complete details on these and other important features are contained in the Control Center Booklet B-4213. Ask for your free copy. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-27021-A

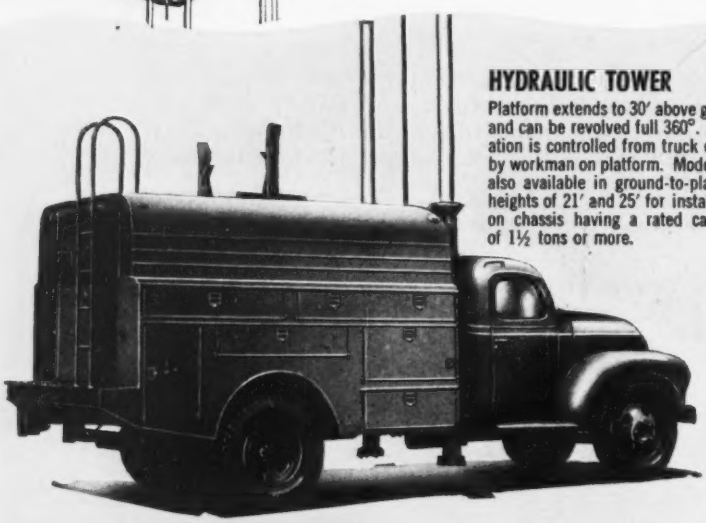
YOU CAN BE SURE...IF IT'S

Westinghouse

"The Accepted Standard with Utilities Everywhere"

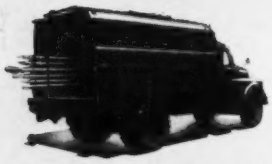


Proved by many years of trouble-free service, *Powers-American* bodies set the pace as the number one choice with utilities everywhere . . . the measurement of top quality and performance throughout the industry. "Job-engineering" steps up crew efficiency, lowers operating costs . . . protects your investment. *Powers-American* has the type body and equipment to do your particular job most efficiently and at lowest cost.



HYDRAULIC TOWER

Platform extends to 30′ above ground and can be revolved full 360°. Operation is controlled from truck cab or by workman on platform. Models are also available in ground-to-platform heights of 21′ and 25′ for installation on chassis having a rated capacity of 1½ tons or more.



LINE CONSTRUCTION BODY (600)

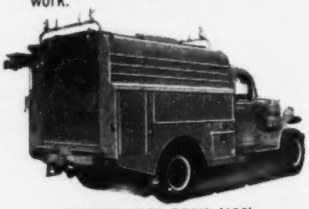
Available in 9′ to 14′ lengths, equipped to meet individual needs in any phase of utility work.

REVOLVING AERIAL LADDER

Models available in working heights of 23′ 6″, 26′ 6″, 30′ 6″, and 32′ 6″ for all styles of bodies.

LIGHT CONSTRUCTION BODY (SERIES 35)

Ideally suited for all types of light duty maintenance and construction work.



MAINTENANCE BODY (400)

Designed for medium duty general service. May be furnished with winch and derrick capable of handling 40′ poles.

POWERS *American* DIVISION

ACF-B

PUBLIC UTILITY BODIES AND EQUIPMENT

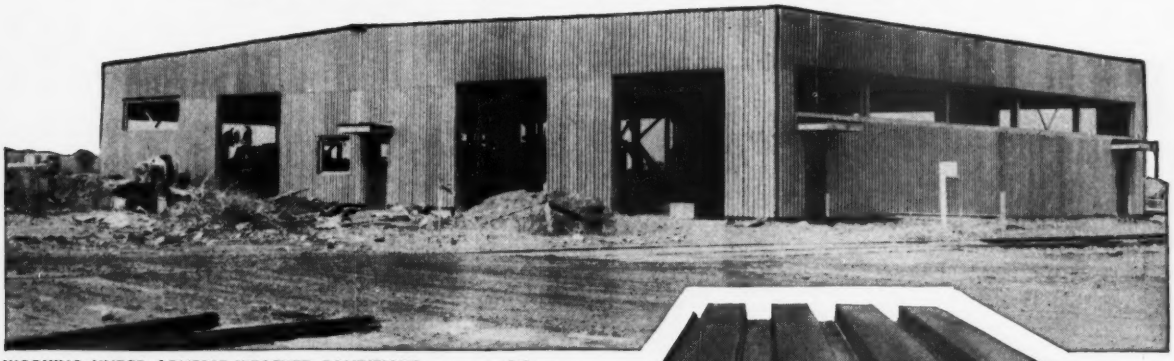
McCABE-POWERS AUTO BODY COMPANY

8007 Manchester Boulevard, Saint Louis 14, Missouri

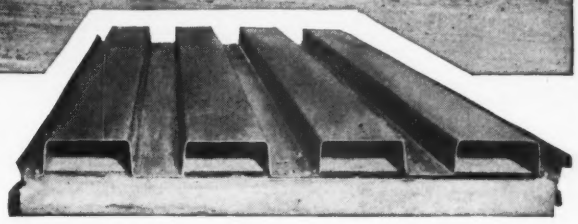
There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

Insulated panels of U·S·S 17 (Type 430) Stainless Steel mean fast, low-cost construction at Fairless Works

4005 sq. ft. of panels installed by crew of 4 in 8 working days



WORKING UNDER ADVERSE WEATHER CONDITIONS, a crew of four installed 4005 square feet of insulated Stainless Steel panels on this building in less than eight working days. The panels were manufactured by H. H. Robertson Co., Pittsburgh, Pa.; installed by R. A. Steelman Co., Trenton, N. J.; architects were Walter Kidde Constructors, Inc., New York.



CROSS SECTION of a complete panel for the fire station at United States Steel's Fairless Works shows the formed Stainless Steel exterior sheet, 1½" of insulation and the coated steel interior.

CONSTRUCTION with insulated building panels of U·S·S 17 (Type 430) Stainless Steel is gaining considerable momentum in the field of industrial building—such as power plants, factory office buildings, warehouses, etc. Architects and owners alike have been quick to recognize the advantages of light panel weight, long building life, minimum maintenance, low labor costs and fast erection in any type of weather.

The building shown here is a Stainless-paneled fire station at the new Fairless Works of United States Steel Corporation at Morrisville, Pa. The 66′ x 100′ structure contains 4005 square feet of insulated panels of 20 gage U·S·S 17 Stainless Steel.

A crew of four men erected the panels under adverse weather conditions in less than eight working days. The prefabricated sandwich panels, consisting of U·S·S 17 (Type 430) Stainless Steel exterior, 1½" of insulation and a coated steel sheet interior, were attached to the structural steel framework by spot welding, a fast and strong method of installation. U·S·S 17 (Type 430) is readily available without CMP tickets.

A new book containing the latest information on construction with panels of U·S·S 17 Stainless Steel is now being distributed. For your copy, use the coupon below.

United States Steel Corporation
525 William Penn Place, Room 2808-N
Pittsburgh 30, Pa.

Please send me your new booklet on U·S·S 17 Stainless Steel for industrial buildings.

Please arrange to have fabricators of Stainless Steel wall panels send me literature on their particular type of construction.

Name..... Title.....

Address.....

City..... State.....

United States Steel produces only the Stainless Steel sheet and strip from which panels of this type are made; the panels themselves are fabricated by a number of our customers.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
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U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

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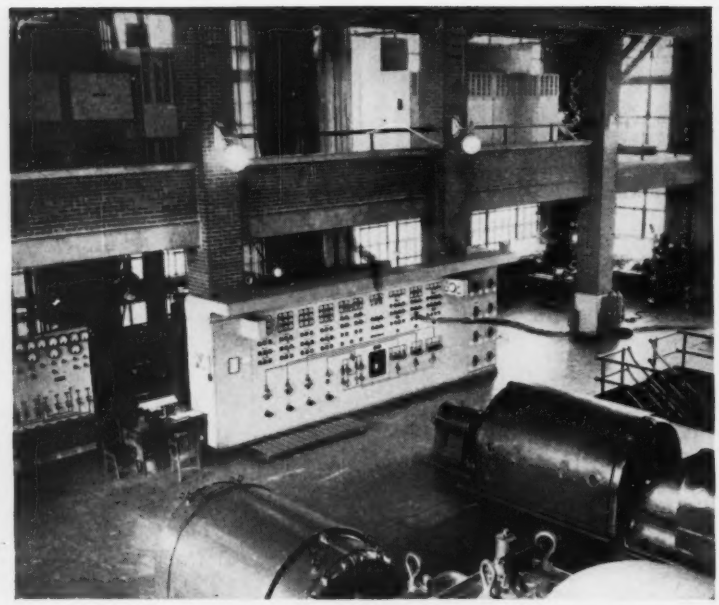
UNITED STATES STEEL



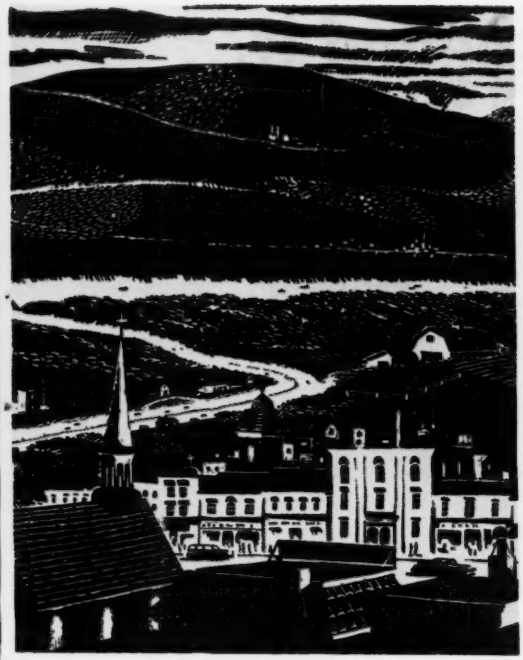
General view of turbine hall in a recently constructed municipal power plant.

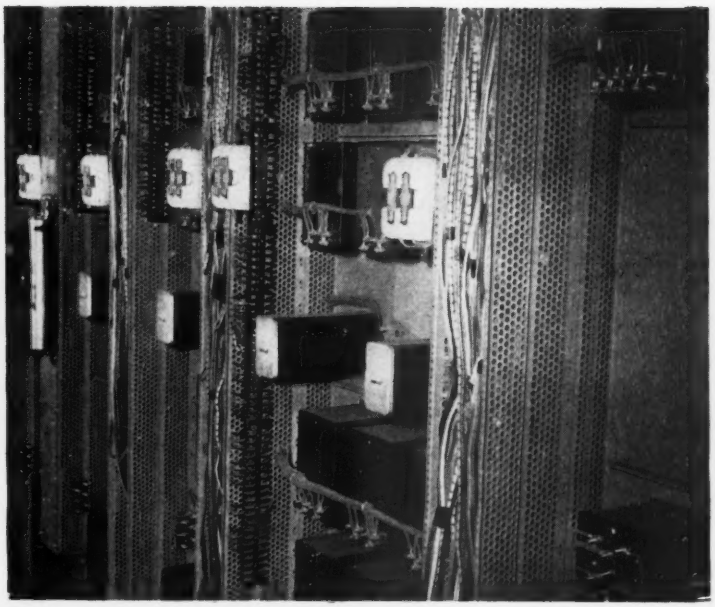
Only the best cable is

MODERN engineering practice often concentrates the entire operation of a power station in one central "brain". So complex is its electrical system that control cables of the finest quality are imperative.

On these pages is shown the panel which completely controls the generation and distribution of power in a typical modern central station. The idea in this installation was to obtain the maximum reliability for the generating station and the whole power system. Everything has been done with this in mind, including the selection of OKOLITE-OKOPRENE throughout.

Shown inside the rear housing of the main control and relay panels in the detail view are the many 600-volt color-coded cables that provide all interconnections for control, metering, indicator, interlock and alarm circuits. The wiring originates in the switch-gear on the balcony floor,





Rear of main control and relay panels showing Okolite-Okoprene control cables.

good enough for this job

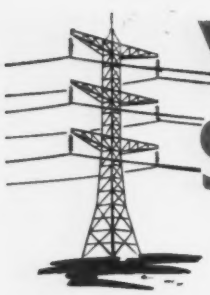
at the secondary terminals of the potential and current transformers and terminates at the control panel.

Wherever rugged operating conditions are found, wherever service requires that outages be kept to a minimum, electrical engineers for over 75 years have been specifying Okonite cables. They take advantage of the Okonite program of constant research to provide more dependable cables. They know Okonite's exclusive strip process . . . how the insulation and sheath are applied simultaneously and vulcanized *only once* in a metal mold, assuring perfectly centered conductors, a more stable and longer-lived insulation and sheath. For further information on OKOLITE-OKOPRENE cables, write for BULLETIN EW-1056. The Okonite Co. Passaic, New Jersey.

products of on-the-job experience

1551

You Told Us You Needed It... So We Proudly Present—



Hotpoint's FULL-SIZED 39-INCH ELECTRIC RANGE

Model RB 49

AT $189.95 suggested retail

Look at these features ordinarily found on ranges selling at much higher prices:

- New Higher and Deeper Super-Oven
- Giant Hi-Speed Waist-High Broiler
- Super-Fast Instant-Heat Calrod® Unit
- Three Hi-Speed Calrod Units
- Roto-Switches for Five Accurate Measured Heats
- Automatic Oven Temperature Control
- Electric Appliance Outlet
- Oven Indicator Light
- Large Storage Compartment
- Titanium Porcelain Enamel Finish

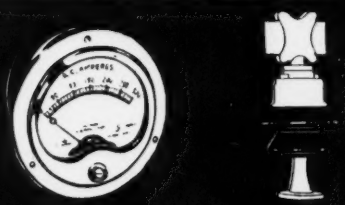
With an appreciation of the problems facing progressive utility companies, Hotpoint has developed this full-sized electric range, at a low price, to assist the effort to bring electrical living to more families of all income levels. This is the range you've been wanting for this specific job. The Hotpoint distributor in your area can give you the whole story.

Hotpoint Co.

(A Division of General Electric Company)

5600 West Taylor Street, Chicago 44, Illinois

MAKING



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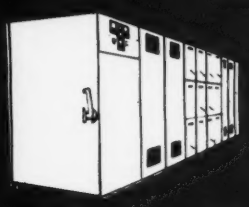

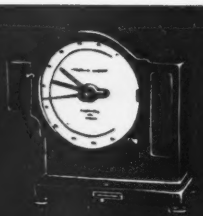

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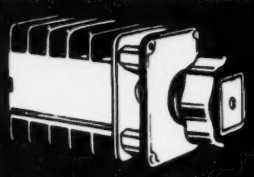
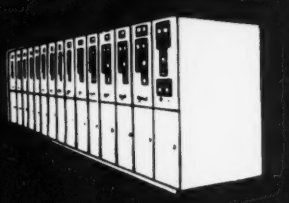
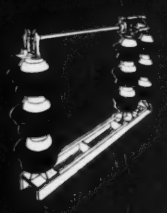
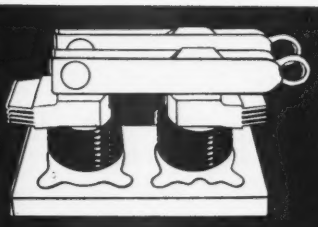


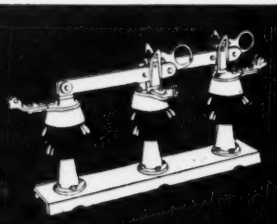


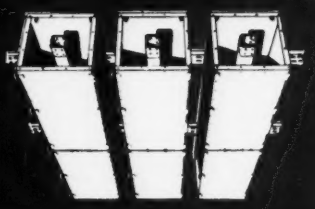
BEST

DISCONNECT SWITCHES • OUTDOOR HOOK STICK SWITCHES • AIR BREAK SWITCHES • INDOOR AND OUTDOOR BUS SUPPORTS • BUS DUCTS • SUBSTATIONS









OIL AND AIR CIRCUIT BREAKERS • HIGH AND LOW VOLTAGE SWITCHGEAR • UNIT SUBSTATIONS • INSTRUMENTS • PRECISION BALANCES • WATTHOUR METERS

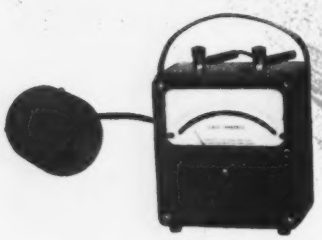
A new series of bulletins, completely illustrating and describing each item in the Roller-Smith and Elpeco lines, is now available. If you will indicate the particular type of equipment in which you are interested, we will be glad to send appropriate bulletins by return mail.

ROLLER-SMITH CORPORATION AND ELPECO DIVISION

instruments for measuring light

Model 703
Sightmeter or
Foot-Candle Meter

The favorite for quick measurements in homes, offices, factories, schools, etc. Calibrated in seeing tasks (Sightmeter) and directly in foot-candles. Available with or without VISCOR® and cosine correction filters. Special Model 703 for use as a Screen Illumination Meter.



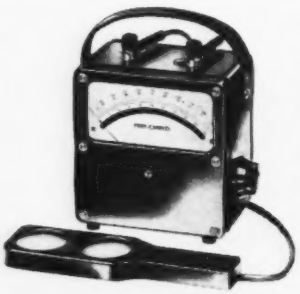
Model 931 Foot-Lambert Meter

A versatile instrument for the direct measurement of brightness. It also meets the requirements as outlined by the Phosphor Committee of the RMA for television tube brightness measurements. A VISCOR® filtered high output cell is used in conjunction with a very sensitive microammeter. The cell is equipped with a tubular baffle which restricts the oblique light and provides a basic range of 0-60 foot-Lamberts. A removable multiplier disc provides a second range of 0-300 foot-Lamberts.

Completely self-contained, permanently calibrated, and color corrected, Weston Light Measuring Instruments are available for practically all requirements in research, factory, office or home. A bulletin giving complete details on all models and on color and cosine correction features is available on request. WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

Model 614 Foot-Candle Meter

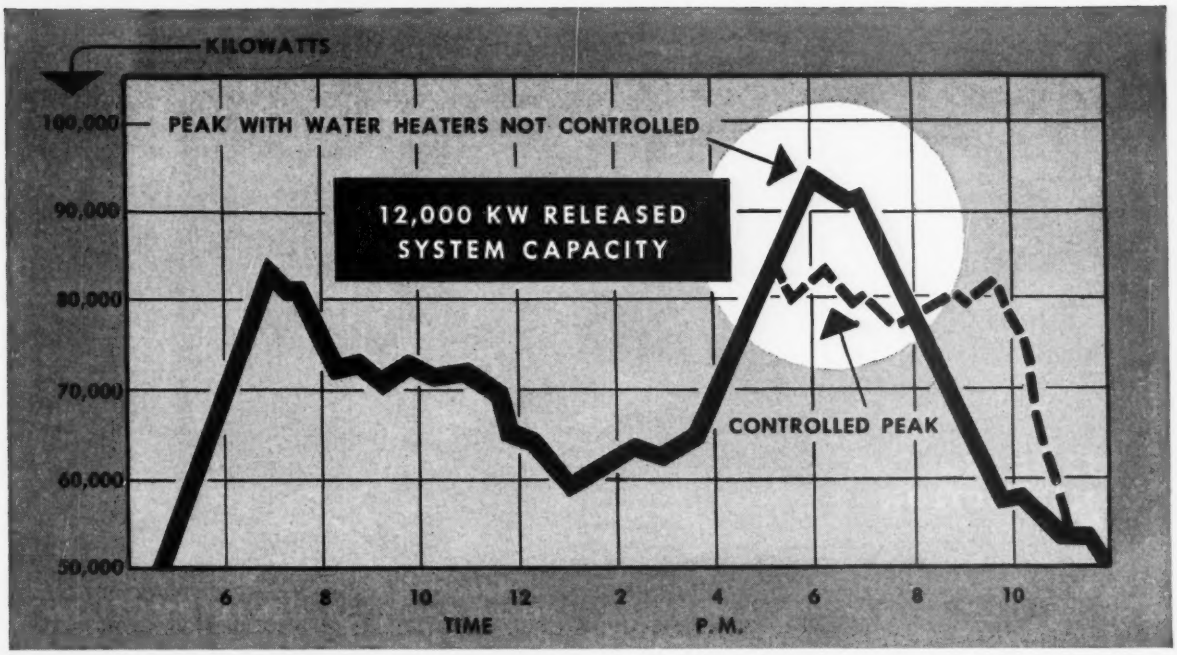
Ideal for commercial lighting surveys and general light measurements. Hinge mounted PHOTRONIC® Cell can be tilted to facilitate use. Measures all types of commercial lighting directly. Wide range of light values, with convenient range-changing switch. Self-contained in sturdy Bakelite case with handle.



Model 756 Illumination Meter

For light measurements requiring a high degree of accuracy over broad ranges. Ideal for research work and for checking other instruments. Corrected for color and Lambert's Cosine Law ... long mirror scale and knife edge pointer...convenient range changing switch...furnished in sturdy leather carrying case with neck strap.

WESTON
LIGHT MEASURING *Instruments*



TYPICAL SUBSTATION LOAD CURVE IN AREA USING 20,000 WATER HEATERS SHOWS RELEASED LOAD THROUGH USE OF OFF-PEAK CONTROL

Released Capacity with Off-Peak Control . . . Fact or Fantasy?

A major benefit of off-peak control lies in its ability to release the available kilowatts between peak load *with* control and peak load *without* control.

The electric water heater load is expected to more than double in the next eight years. In 1960 annual sales of electric water heater sales will be an estimated 1,800,000 and the total annual water heater load will be approximately 35 billion KW hours.

RELEASED POWER

The capacity released in the distribution system (by off-peak control) can absorb additional domestic load—created, during the control period, by electric ranges, automatic washing machines, and other appliances. Savings result in deferred investment for new capacity.

FOR EXAMPLE

Let's assume that there are 20,000 electric water heaters on a system. Multiply this number by 0.6 (the average KW demand per heater) and get the number of KW's released in the distribution system. In this case it's approximately 12,000 KW's. Apply this simple formula to your own system and see how much capacity off-peak control can release for you.

COST COMPARISONS

Industry figures for the last six years show that each kilowatt of installed capacity costs approximately $500.*

The diversified contribution of each water heater to the total load is approximately 0.6 KW. Therefore, each water heater accounts for 0.6 x $500—or $300 of installed capacity.

Contrast this with only $25–50 per water heater installation for off-peak control.

LARGE SAVINGS POSSIBLE

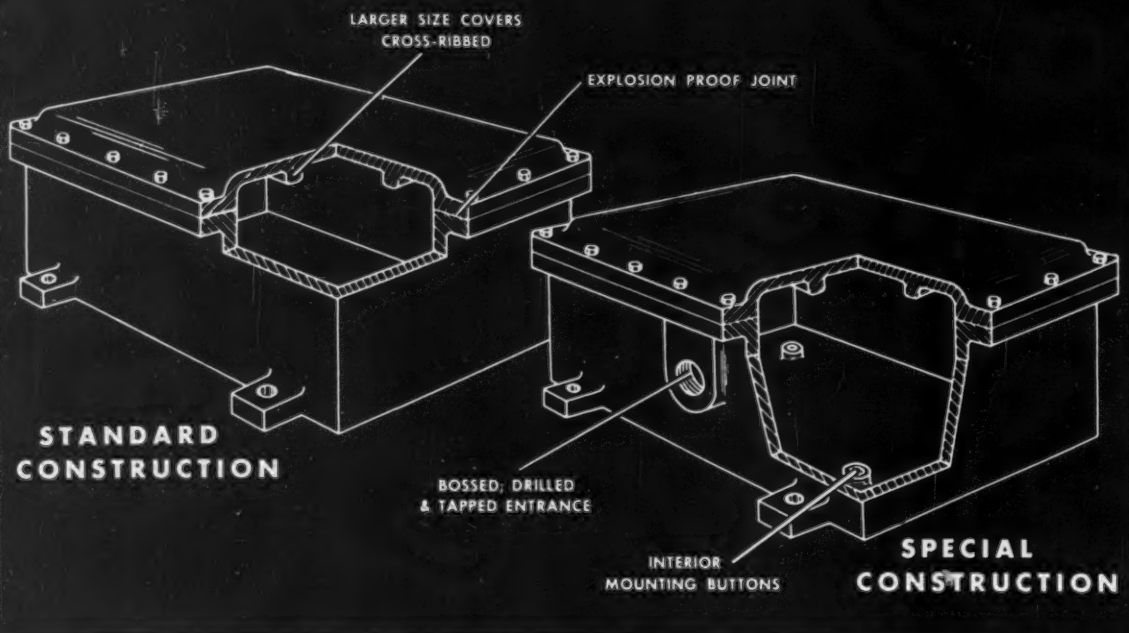
At a cost of $500 per kilowatt of new capacity, 12,000 KW of water heater load would cost approximately $6,000,000. Yet off-peak control makes it possible for new load to be added without necessitating new facilities to this extent.

SYSTEM STUDIES NEEDED

A thorough study of the economics of off-peak control (in the light of your own system) is needed if proper evaluation of individual requirements is to be made. Your General Electric Apparatus representative is prepared to discuss with you the possibilities which off-peak control may offer your own situation. For a more detailed report on the subject, write for bulletin GEA-5686 on the subject of off-peak control. Write to General Electric Company, Schenectady 5, N. Y. 603-143

**ELECTRICAL WORLD, Statistical Issue, Jan., 1951.*

GENERAL ELECTRIC



Leading engineering and erection firms agree:

For hazardous locations, you can count on EXPLOSION HOUSINGS by HOPE

FIRST, see how *thoroughly* Explosion Housings by Hope meet every requirement for installation in Class I, Groups C and D hazardous locations.

Boxes and covers are of extra-strong construction. Covers are cross-ribbed on larger boxes. (Naturally, like all Boxes by Hope, Explosion Housings are of strong, dense cast iron, hot dip galvanized for both service durability and lastingly attractive appearance.)

Precision finished metal-to-metal joints assure explosion-proof construction. Housings have been successfully used as junction and pull boxes and as enclosures in refineries, chemical plants, paint plants, dry cleaning establishments, powder mills and pumping stations.

NEXT, see how *easily* Explosion Housings by Hope meet your every need:

You can select the Housing you want from a list of *81* standard sizes.

You can order special modifications at moderate cost. For instance: entrances can be drilled and tapped to your specifications. Bosses can be supplied to insure five threads on larger-sized conduit holes. Interior blind-tapped mounting buttons can be furnished for safe and easy installation of apparatus or panels. Heavy covers can be provided with bronze hinges.

AND . . . you can order the Explosion Housings you want — standard or with special modifications — through your local electrical distributor!

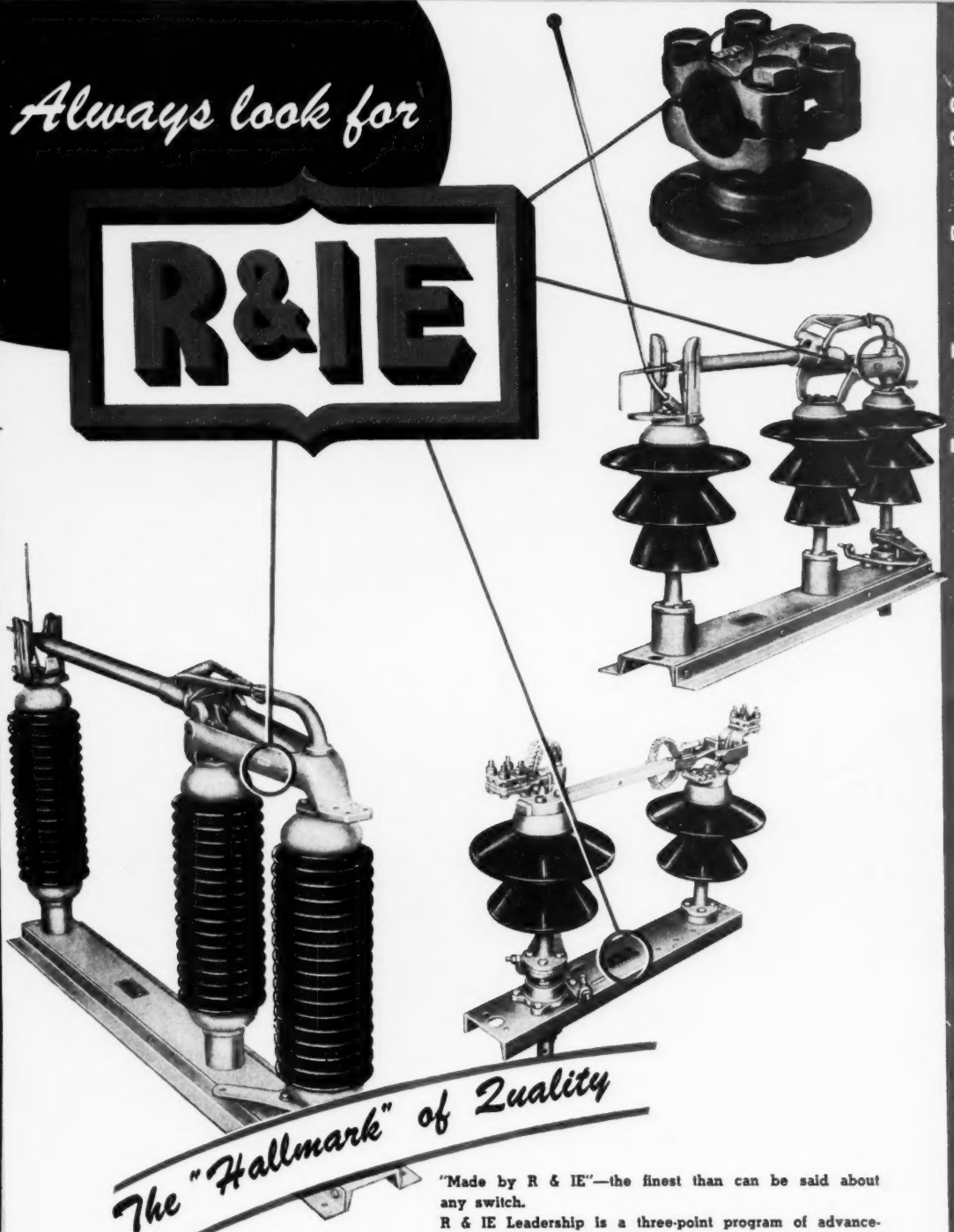
HOPE

ELECTRICAL PRODUCTS CO., INC.
338 Wilson Ave., Newark 5, N. J., Mitchell 2-4426

FOR THE FULL STORY ON EXPLOSION HOUSINGS BY HOPE
—and also on our line of hundreds of sizes of weatherproof products: outlet boxes and fittings, junction and pull boxes, hinged cabinets and terminal boxes—write on your letterhead for a copy of our latest catalog

Always look for

R&IE



The "Hallmark" of Quality

"Made by R & IE"—the finest than can be said about any switch.

R & IE Leadership is a three-point program of advancement—1. Progressive Design. 2. Consistent Manufacturing Quality. 3. Customer Cooperation. The trademark R&IE represents years of engineering achievement plus safe, economic and reliable service.

With the change of name as shown below, R & IE Leadership will continue with the same skill and know-how that has brought complete customer satisfaction in the past. Always look for the R & IE trademark—"the Hallmark of Quality".

I-T-E R&IE

R&I E EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER COMPANY

GREENSBURG, PA.

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

LINEMEN
praise their
CLEANLINESS

MANAGEMENT
praises their
DEPENDABILITY

...They're BOTH protected...by Life Span

LIFE-SPAN

WESTERN RED CEDAR POLES are completely protected against termites and decay. Once protected they are sealed for life. Once installed they are set for many added years of dependable service. Maintenance costs go down, company profits go up! Here truly is unmatched dependability that is continually praised by management everywhere.

The lineman is protected too! He likes to work on LIFE-SPAN Poles because they are clean, easy to handle and safe to work on.

SOLD ONLY BY THE FOLLOWING:

Naugle Pole & Tie Corp
Chicago, Illinois

Page & Hill, Inc.
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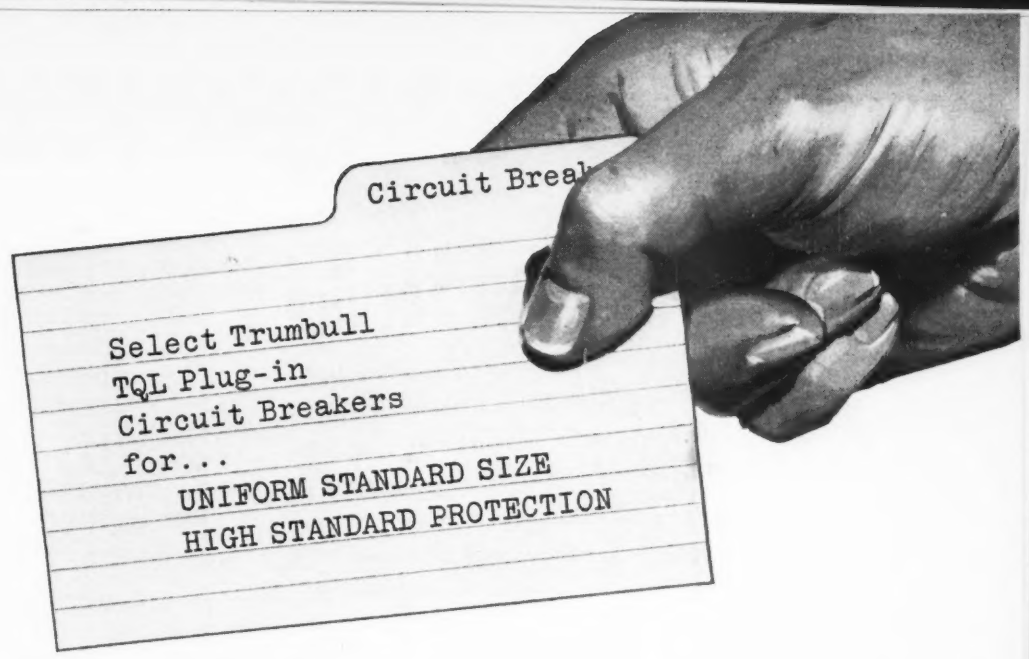
B. J. Carney & Co.
Spokane—Minneapolis

Schaefer-Hitchcock Co.
Sandpoint, Idaho
(Suppliers for Joslyn Mfg. & Supply Co.)

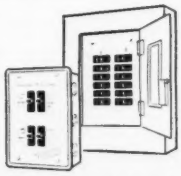
CONSOLIDATED TREATING CO.
MINNEAPOLIS, MINNESOTA



Trumbull TQL Plug-in Breakers from 10 through 50 amp. ratings are all made to the same standard dimensions — physically interchangeable not only in Trumbull Load Centers and Panelboards but also dimensions of these breakers have been adopted by leading manufacturers. This means convenience, economy and time saving for the contractor or plant electrician.

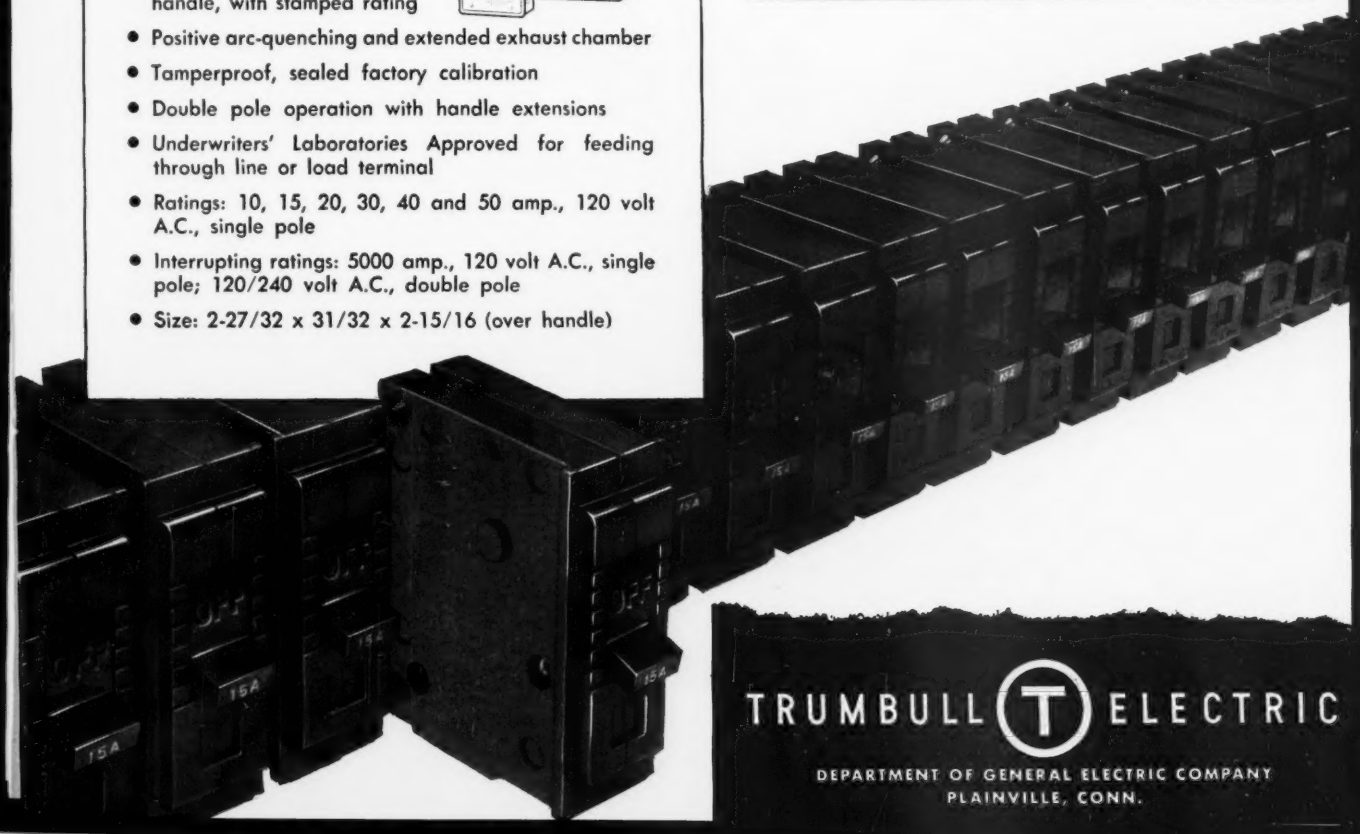
Trumbull also sets the quality and safety standard with a thermal-magnetic trip for positive protection against both shorts and sustained overloads. Compact and economical to buy and install. They pay for themselves because they are built to last a lifetime. They pay big dividends in letting you restore service quickly after short or overload is corrected. They may well save a capital investment by prevention of overheated circuits.

Quick Facts



- Quick-make, Quick-break
- Trip indicating, trip free handle, with stamped rating
- Positive arc-quenching and extended exhaust chamber
- Tamperproof, sealed factory calibration
- Double pole operation with handle extensions
- Underwriters' Laboratories Approved for feeding through line or load terminal
- Ratings: 10, 15, 20, 30, 40 and 50 amp., 120 volt A.C., single pole
- Interrupting ratings: 5000 amp., 120 volt A.C., single pole; 120/240 volt A.C., double pole
- Size: 2-27/32 x 31/32 x 2-15/16 (over handle)

Leading Electrical Distributors everywhere stock Trumbull equipment. See your local Trumbull Distributor for top values and alert service. For complete descriptive literature, write for TEB-12.



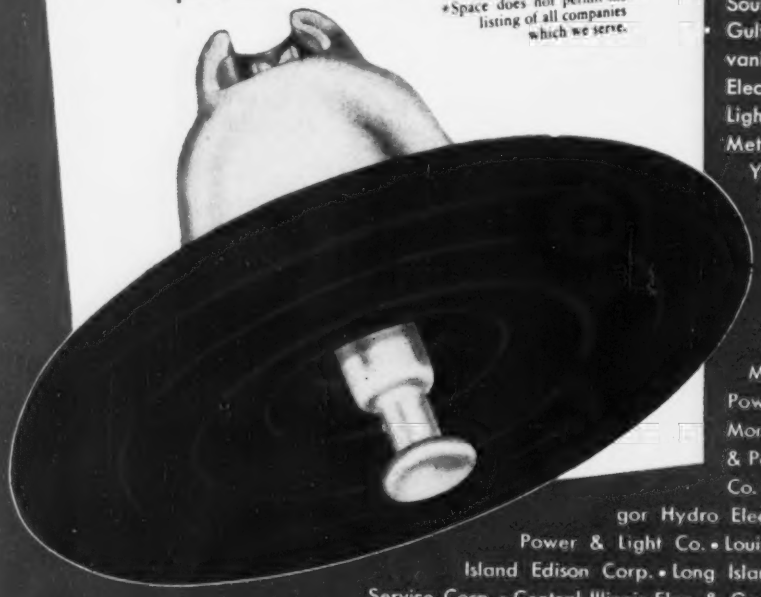
TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

Recognized Service

The Electric Power Industry is recognized for its unselfish service to the public and to the communities which it serves. Dependable, uninterrupted electrical service, though often taken for granted can only be sustained through eternal vigilance and a wise and critical selection of all components entering the electrical system. Porcelain Products ... proud of the part it plays in serving the Electric Power Industry through hundreds of individual power companies, many of which are recorded here*—dedicates itself to supplying the Industry with quality insulators and accessories at all times.

*Space does not permit the listing of all companies which we serve.



Houston Lighting & Power Company • Manilla Electric Company • Louisville Gas & Electric Co. • Detroit Edison Company • South Carolina Electric & Gas Co. • Memphis Light, Gas & Water Div. • Tucson Gas, Electric Light & Power Co. • Southern Utah Power Company • Oklahoma Gas & Electric Company • Delaware Power & Light Company • Missouri Power & Light Company • Potomac Electric Power Company • Northwestern Public Service Co. • Northern States Power Company • White Mountain Power Company • Public Service Electric & Gas Co. • Iowa Electric Light & Power Co. • Central Ohio Light & Power Co. • Kentucky Utilities Company • Atlantic City Electric Company • Florida Power & Light Company • Iowa Southern Utilities Company • Missouri Public Service Corp. • Toledo Edison Company • Monongahela Power Company • Arkansas Power & Light Company • Appalachian Electric Power Co. • Southwestern Public Service Co. • Gulf States Utilities Company • Pennsylvania Power Company • Pennsylvania Electric Company • Carolina Power & Light Company • Florida Power Corp. • Metropolitan Edison Company • New York State Electric & Gas Co. • Philadelphia Electric Company • Puerto Rico Water Resources Authority • Iowa Power & Light Company • Eastern Kansas Utilities • Kansas Gas & Electric Co. • Gulf Public Service Co. • Green Mountain Power Corp. • Pennsylvania Power & Light Co. • Idaho Power Co. • Montana Power Co. • Virginia Electric & Power Co. • Cincinnati Gas & Electric Co. • Montana-Dakota Utilities • Bangor Hydro Electric • Ohio Edison Co. • Minnesota Power & Light Co. • Louisiana Power & Light Co. • Staten Island Edison Corp. • Long Island Lighting Co. • Wisconsin Public Service Corp. • Central Illinois Elec. & Gas Co. • Western Light & Telephone Co., Inc. • Frontier Power Co. • Hawaiian Electric Company • Georgia Power & Light Company • Lake Superior District Power Co. • Southern Indiana Gas & Electric Co. • Stone & Webster.

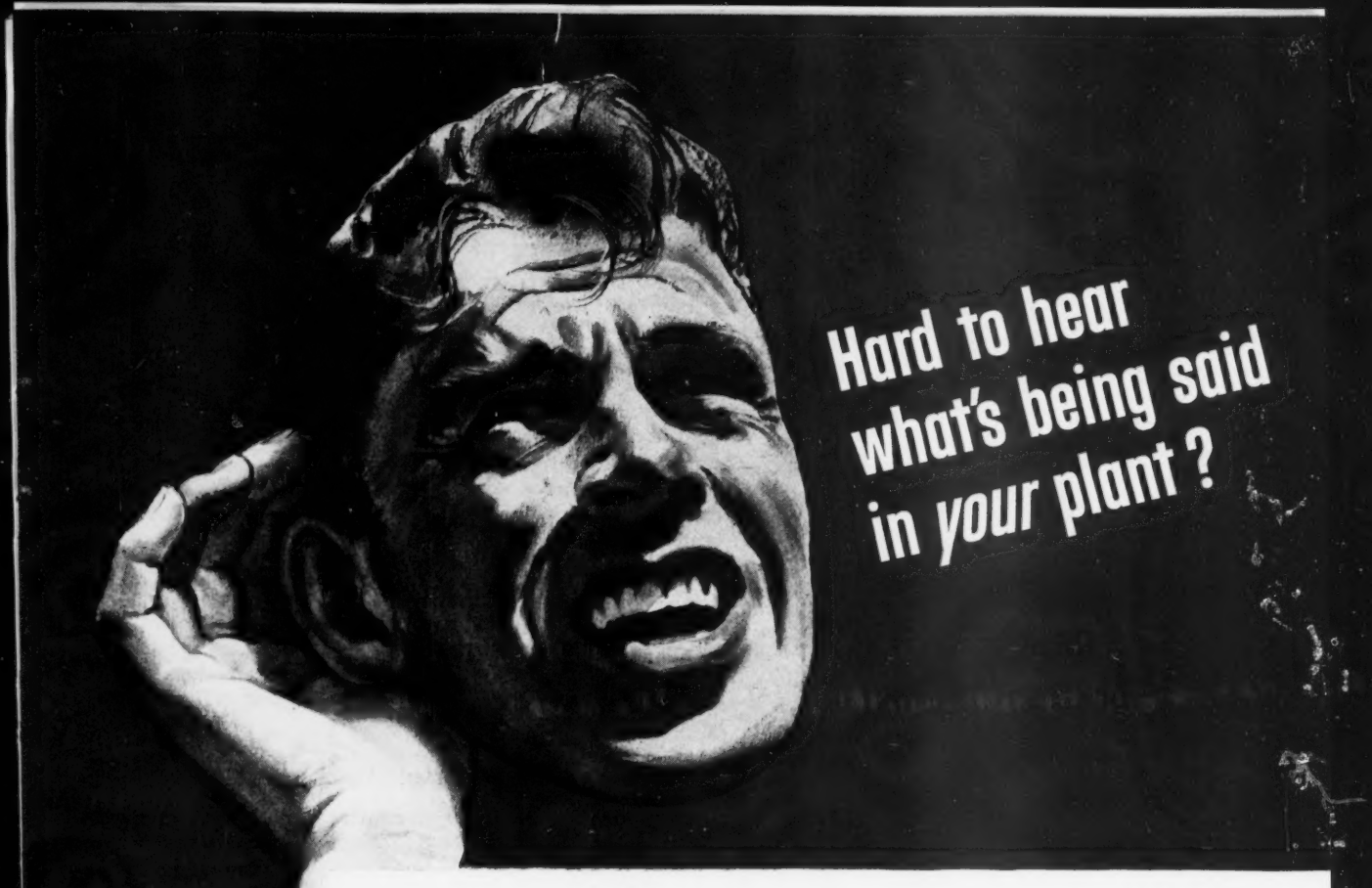
A COMPLETE LINE OF TRANSMISSION AND DISTRIBUTION INSULATORS AND ACCESSORIES FOR ELECTRIC UTILITIES

YOUR INDEPENDENT INSULATOR MANUFACTURER

Porcelain Products, Inc.

PARKERSBURG, W. VA.

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.



Hard to hear what's being said in *your* plant?

It won't be—if your plant is equipped with a Gai-Tronics Communication System. A Gai-Tronics System is fast and sure, because practically normal conversation is possible where noise is a problem —*even without* acoustic booths!

With a Gai-Tronics System, two-way or group-conversations take place over special telephone-type handsets and sound projectors, especially designed for operation in high noise levels. Emergency instructions can be heard in all areas *at once!* This means no shouting, no strain, no garbling of important instructions. Damage to costly equipment is prevented, shutdown time is reduced, hazard during start-ups is minimized, and manpower is used more efficiently! If you desire, telephone-type privacy may be had with the flick of a switch, even though the system remains alerted for emergency use.

A Gai-Tronics System is surprisingly low-priced because it is designed by specialists thoroughly familiar with *all* the problems of power plant operational intercommunication. It is thoroughly engineered for *your* plant and *your* operational procedure. Effective, trouble-free operation; simplicity and economy of installation and maintenance are paramount design features. A Gai-Tronics power plant communication specialist will be glad to discuss your communication problems at your convenience.

GAI

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A SUBSIDIARY OF GILBERT ASSOCIATES, INC.

412 WASHINGTON STREET • READING, PENNSYLVANIA

A man with a hate

● There's no halfway feeling about fire and its resulting destruction with an expert fire protection engineer... he actually hates to see a little fire roar into a raging inferno and create a sizeable loss.

This personal sense of responsibility is inherent with C-O-TWO Fire Protection Engineers... a definite plus in your behalf. Whether its fire detecting or fire extinguishing ... portables or built-in systems... C-O-TWO means top quality backed by experienced engineering that results in operating superiority for you at all times.

With C-O-TWO Fire Protection Equipment, simplicity, practicability, longevity and minimum maintenance are built-in features that guarantee fast, positive action the instant fire strikes. Furthermore, extensive manufacturing and field installation skills, together with approvals such as the Underwriters' Laboratories, Inc., Factory Mutual Laboratories, Armed Forces and Government Bureaus assure you of the finest in modern fire protection equipment.

Rushed production periods and future expansions are some of the many problems carefully considered in a plant-wide firesafety recommendation by C-O-TWO Fire Protection Engineers... the prime objective always being the best type fire protection equipment for the particular fire hazard concerned.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today... our extensive experience over the years is at your disposal without obligation. Get the facts now!

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MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
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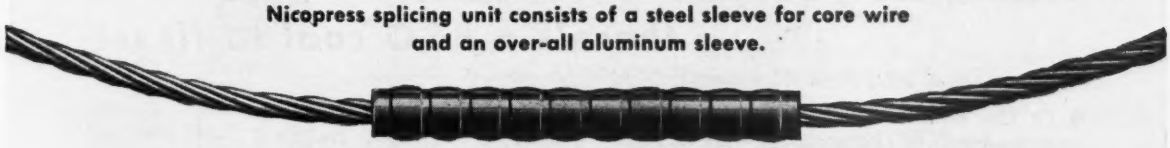
AFFILIATED WITH PYRENE MANUFACTURING COMPANY

Nicopress SLEEVES for A·C·S·R·

WILL GIVE YOU PEAK PERFORMANCE!

COMPLETED LINE SPLICE

Nicopress splicing unit consists of a steel sleeve for core wire and an over-all aluminum sleeve.



COMPLETED JUMPER SPLICE

REPAIR SLEEVE
(Partially Completed)

Nicopress is the Registered Trade-Mark of The National Telephone Supply Company

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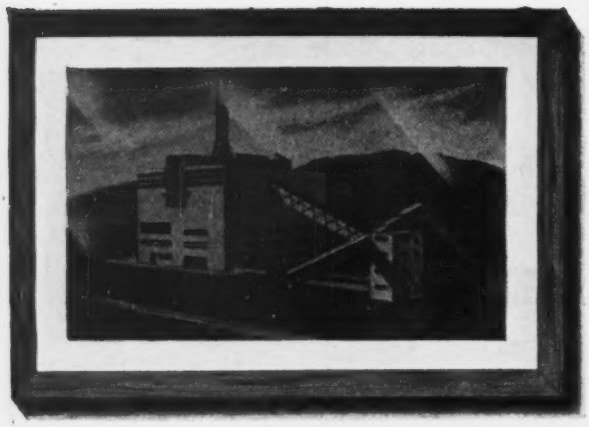
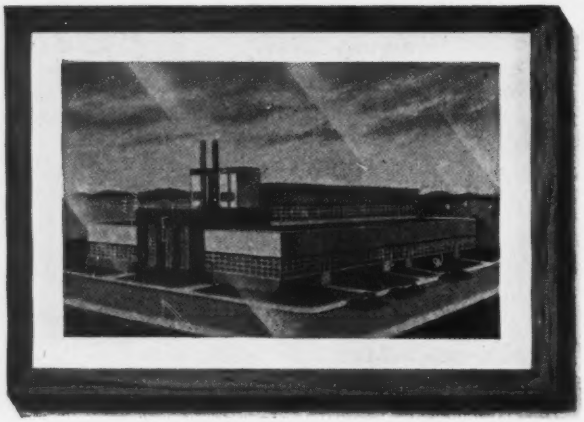
THE NATIONAL TELEPHONE SUPPLY COMPANY





Whatever your fuel picture, *there's a B&O coal to fit it!*

• In the Baltimore & Ohio area lies a treasure-land of Bituminous—an almost inexhaustible source of low-cost heat and energy. Here are found Bituminous coals *of all varieties*—for power, for coking, for steam, for space heating.

B&O coals are excellent for generating steam in utility and industrial power plants, for steel mills, malleable iron plants, gas plants, lime and brick kilns, cement and glass plants, and potteries.

Whatever your "burning need," Industrial or Domestic, there's a B&O coal to meet it—and we are ready to help you find the best for your purpose. Just *ask our man!*

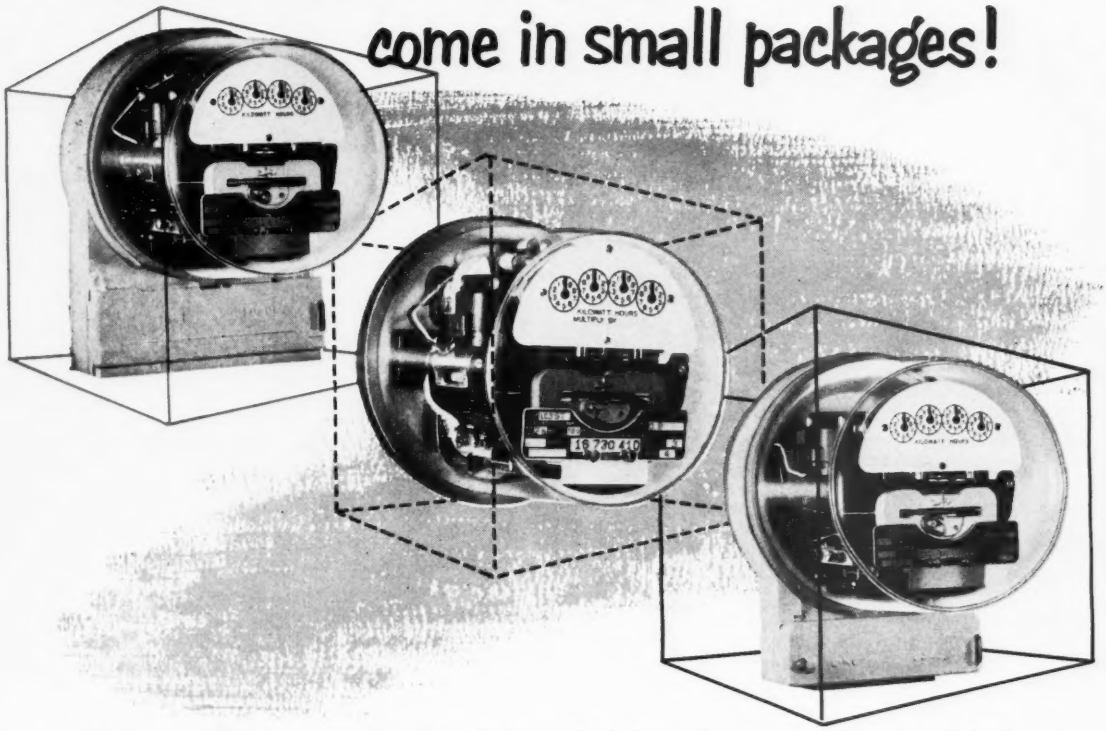
BITUMINOUS COALS FOR EVERY PURPOSE

LINKING 13 GREAT STATES WITH THE NATION
B&O

BALTIMORE & OHIO RAILROAD

Constantly *doing things* —better!

All Sangamo Polyphase Meters come in small packages!



Because of their single disk construction, *all* Sangamo Polyphase Meters, whether 2, 2½, or 3 element, come in the smaller sizes required of modern power meters. This saves installation time and expense. For example, on change-overs to 4-wire network systems, the Sangamo LC-3 Element Meter will fit in exactly the same space as the delta 2 element meter which it replaces.

Besides the smaller size and lighter weight, the use of but a single disk also increases bearing life, lessens the effect from friction on light loads, and provides stability of calibration.

Too, there is the convenience of all adjustments, including the micrometer adjustments for full load, light load, inductive load, and element balance, being readily accessible—with just a screwdriver—enabling easy testing on the premises.

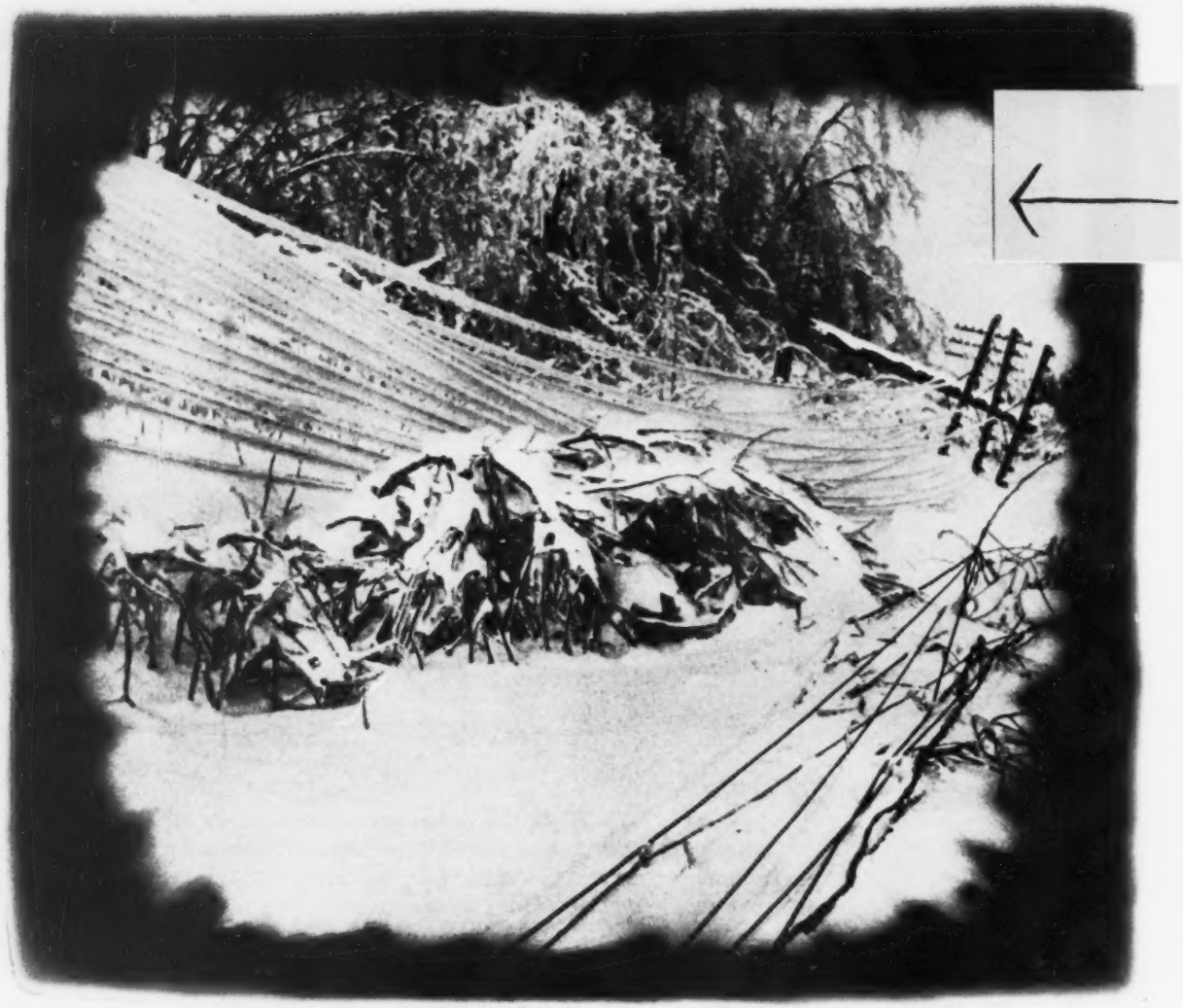
And if it should be necessary to install your polyphase meters in locations of extreme exposure to corrosive industrial or salt atmospheres, you can now expect much longer meter life because of the new corrosion-resistant finishes with which all Sangamo Meters are treated.

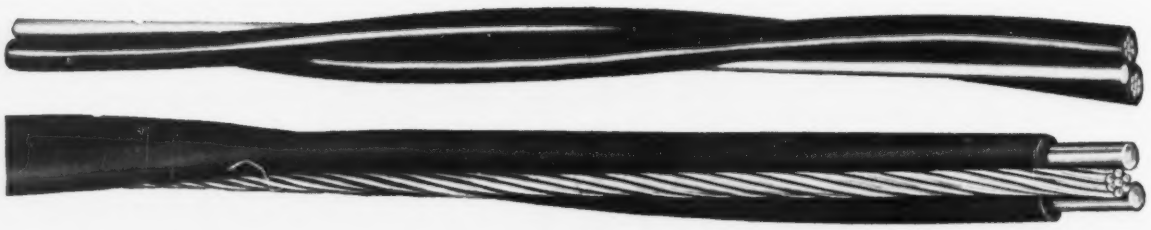
For more detailed information on Sangamo Polyphase Meters ask your Sangamo Representative.

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Only Measured Facts are Known Facts

SM53-1





(TOP) **ROME COPPER TRIPLEX SELF-SUPPORTING CABLE**—600 volts RoPrene (Neoprene) or RoLene (polyethylene) insulated copper conductors. Copper or copperweld messenger.

(BOTTOM) **ROME ALUMINUM TRIPLEX SELF-SUPPORTING CABLE**—208 volts RoPrene or RoLene insulated aluminum conductors. ACSR or all-aluminum messenger. Light weight assures easy installation—permits long spans with few poles.

Guard against this nightmare

Wind and ice loading are kept at a minimum by Rome self-supporting cables. They reduce crossarms and permit shorter poles.

Fewer accessories, reduced cable cost and cleaner, neater installations result from using Rome Triplex service drop cable.

Poles top-heavy with crossarms and wires. A viscious ice storm. Heavy winds. Broken poles and wires. It is the nightmare of power outage and costly replacements.

You can minimize this expense and customer dissatisfaction by standardizing on Rome self-supporting cables.

Manufactured to your specification, with either copper or aluminum conductors, Rome self-supporting cables utilize the time-proven construction of insulated power conductors spiralled around, or bound to a neutral or supporting messenger. These cables are mechanically predesigned, with a large factor of safety, to anticipate ice and wind loading.

Low installation and maintenance costs

You will realize substantial savings with Rome self-supporting cables, both in installation and maintenance. Crossarms can be eliminated, less hardware is required and, often, fewer poles because of longer spans. Maintenance costs are lower, too. Requiring no common covering, conductors are readily accessible for easy taps. Tree trimming is minimized through excellent resistance to abrasion.

Longer service life in all weather

Insulated or sheathed with RoLene (polyethylene) or RoPrene (Neoprene), Rome self-supporting cables are unaffected by sunlight, moisture and corrosive atmospheres. There are no fibrous braids to rot and festoon. Replacement is kept to a minimum. Better voltage regulation is, also, a factor because of lower reactance due to the close spacing of insulated conductors in long or heavily loaded circuits.

Whether for 600 volts or 15,000 volts, if it is going overhead, it will pay to do as so many others are doing... check the advantages and economies of Rome self-supporting cables. They are cables engineered to the service involved. The coupon below will bring you information on their properties and characteristics.

You'll find a wealth of helpful information on physical and electrical characteristics, specifications, dimensions and installation data on these and other Rome wires and cables in Bulletin RS-4 and the Power and Control Cable Catalog. Send for them today. Mail the coupon.

ROME CABLE Corporation
ROME • NEW YORK
and
TORRANCE • CALIFORNIA

ROME CABLE CORPORATION, Dept. EW-1, Rome, N. Y.
Please send copy of .... Bulletin RS-4; ..... Rome Power and Control Cable Catalog.

Name.....

Company.....

Address.....

City..... Zone..... State.....

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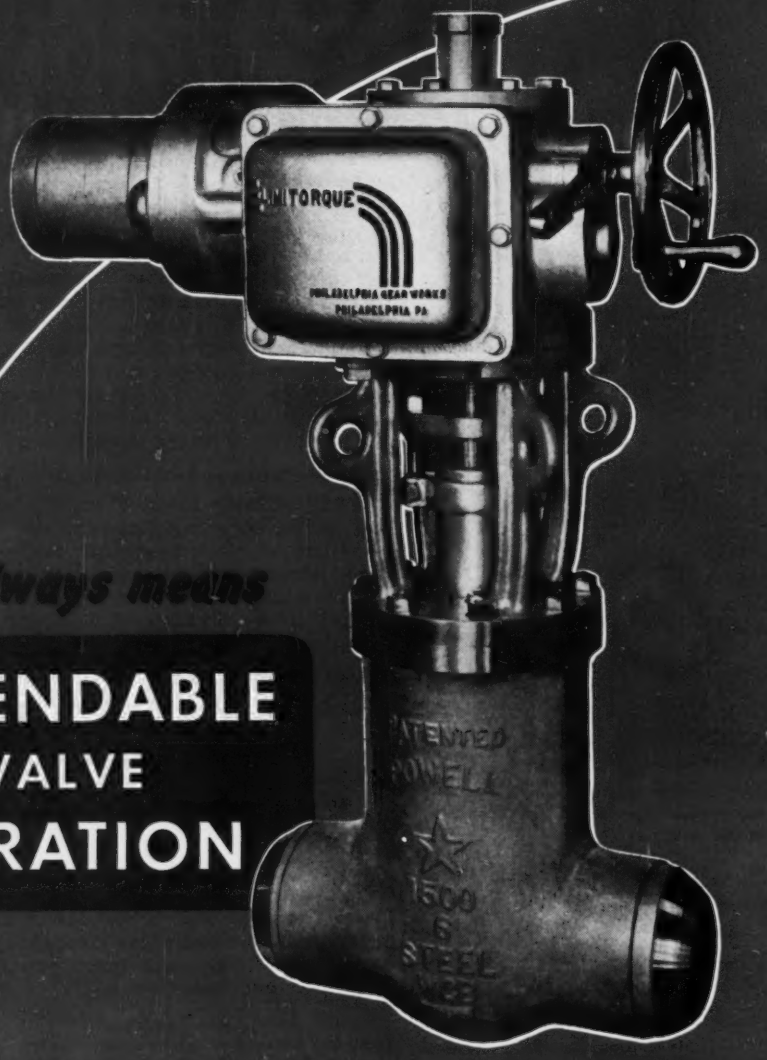

. . . always means

DEPENDABLE VALVE OPERATION

The Most Widely Used Automatic Valve Operator in the World

For details, get our Catalog L-50

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Industrial Gears and Speed Reducers
LimiTorque Valve Controls

BENJAMIN "Magna-Flo" Systems Excel!

that's why Overall Lighting Costs are LOWER!

Because Benjamin "Magna-Flo" Systems excel by every Quality Standard—lighting, electrical and constructional—they can provide high illumination levels at low overall lighting cost. Such cost involves more than the original price of the units. Overall lighting cost also includes the costs of installation, operation, maintenance and replacement. Add them all up and see why you're ahead with "Magna-Flo" Systems (individual unit or continuous line)—because "Magna-Flo" excels by ALL QUALITY STANDARDS!

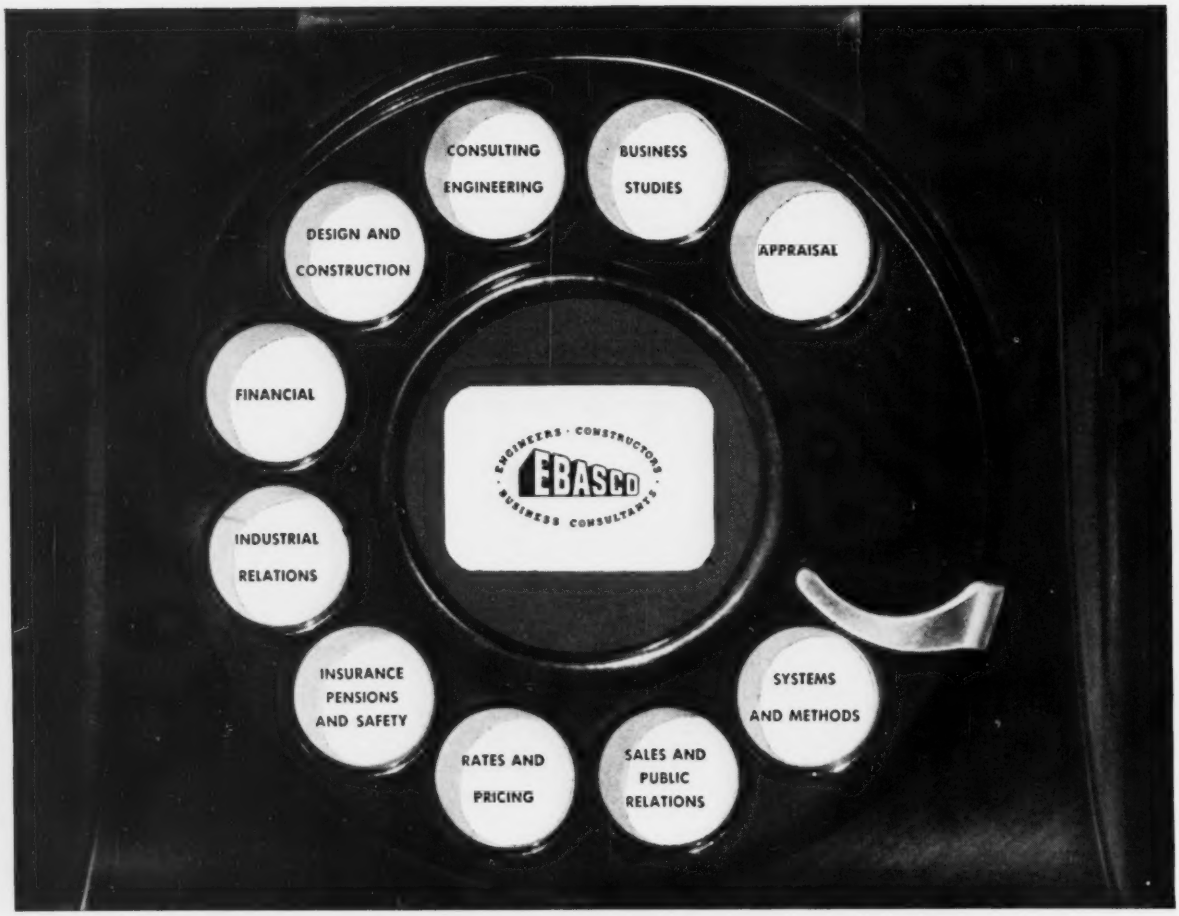
This chart gives some of the important reasons why:

"MAGNA-FLO" CUTS INSTALLATION COST	"MAGNA-FLO" CUTS MAINTENANCE COST	"MAGNA-FLO" CUTS OPERATION COST	"MAGNA-FLO" CUTS REPLACEMENT COST
wide variety of knockouts facilitate wire entrances into unit.	Porcelain Enamel reflecting surface is easy to keep clean with soap and water.	made for efficient utilization of high light output T12 Slimline lamps.	famous Benjamin "built-like-a-battleship" construction of heavy gauge steel.
complete line of sliding hangers.	exclusive "Springlox" lampholders make possible "quick-in, quick-out" lamp maintenance.	high power-factor ETL-approved ballasts for continuously-cool, efficient operation.	rigid channels and reflectors withstand toughest industrial vibration.
single, rugged channel coupling for continuous mounting.	Speedy, exclusive "Lok-Latch" reflector fasteners.	high reflection factor remains constant because genuine Porcelain Enameled reflector does not discolor or become dull with age.	96" reflectors are made in two sections, kept perfectly aligned by positive alignment clips.

FREE Bulletin AD-5705 brings you complete specifications on Benjamin "Magna-Flo" Lighting Systems—famous for "Task-Matched" Lighting Installations.
Benjamin Electric Mfg. Co., Dept. R, Des Plaines, Ill.

Benjamin "Magna-Flo" Systems are Sold Exclusively through Electrical Distributors

B-5925RHR



Who will you call for these services in 1953?

In the year ahead, chances are your firm will need services like these. Since few companies maintain staffs large enough to include specialists in all these fields, more and more management men are finding that the best way to get the assistance they need is to call an organization like EBASCO.

For when you call EBASCO, you call a team of specialists—engineers, constructors, business consultants—men whose technical talents are at a premium in today's tight manpower market. They provide you with the service your particular problem requires —and do it without adding to your permanent payroll, overburdening your busy staff or wasting the valuable time of your top executives.

In half a century of serving business and industry, EBASCO has been engaged by small, as well as large companies all over the world. In the field of construction, it has built over a billion dollars worth of new plants. In financing, it has assisted in the raising of over two billion dollars.

Next time a need arises in your company for special assistance in engineering, construction or any phase of business operations, ask your operator to connect you with EBASCO.

For a full story of EBASCO's scope of operations, write for your free copy of "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. M, Two Rector Street, New York 6, N. Y.

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EBASCO TEAMWORK GETS THINGS DONE ANYWHERE IN THE WORLD

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Get Sound Bus Joints the Easy Way!

Neoprene Boot Simplifies Installation!

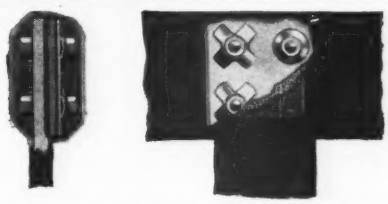
Only Allis-Chalmers Switchgear Uses This Method of Bus-Joint Construction

USERS OF ALLIS-CHALMERS Switchgear make or inspect bus joints in a fraction of the time and with none of the mess involved with any other switchgear. Best of all, it's a strong, corona-free joint meeting full impulse levels.

See how simple it is to make the bus joint. It's as easy in the field as it is in the factory. And note the construction details of these rigid joints.

This is but one of many advantages of Allis-Chalmers Switchgear. Get the full story from your nearby Allis-Chalmers district office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3863



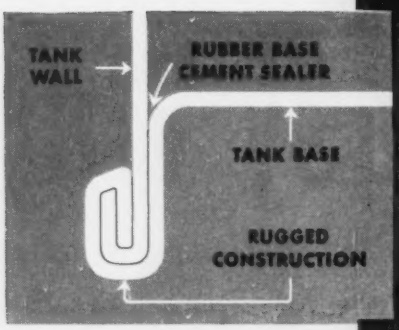
HERE'S HOW BUS JOINT IS MADE

1. Bus bar connections are of round edge copper bar with at least 98 percent conductivity. Connections are silver plated to reduce contact resistance, and prevent overheating and oxidation. A combination of spring washers and lock washers assures proper contact of bars at all times. Slotted bolt holes permit expansion and contraction of bus... relieve strain on structure.

2. No-corona tape of copper mesh material is applied around the bolts and the overlapping joint. This eliminates corona in the connections and provides a uniform base for the Neoprene rubber boot. Special Neoprene boot with potential transformer tap is provided. A few turns of electrical tape hold the boot in place. No fuss, no muss, no liquid compounds.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



These rolls squeeze trouble out

Of course you don't drop transformers off tail gates, or skid them across concrete floors and roadways. That is, you don't plan for these things to happen. But experience shows they sometimes do.

That's why machines like the one above roll a double seam, joining the base to the tank of every Westinghouse Distribution Transformer. As the rolls squeeze down, they compress a rubber cement applied to the surface of the metal. This cement fills up any capillary spaces which might normally exist.

Result: A positive seal to prevent any leakage . . . a reinforced base as a protection against severe handling . . . additional protection against corrosion at a vulnerable point.

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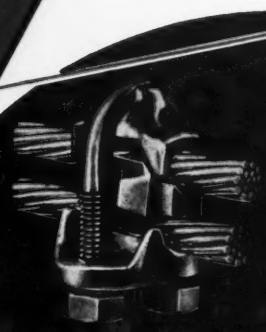

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TEST STANDARD: 500 Inch Pounds Minimum Torque for ⅜ Inch Diameter "U" Bolts.

TEST #2

Approved

TEST #2 Conducted on ABW CONNECTORS

TORQUE: Above minimum test standard applied in all tests caused no failures of ⅜ in. "U" Bolts and no deformation or fracture of clamping members.

TEST #1

TEST #1 Conducted on CONNECTORS of OTHER MANUFACTURE

TORQUE: ***Below*** minimum test standard applied in several tests caused deformation or fracture of clamping members and failure of ⅜ in. "U" Bolts.

Examination of Connector Components That Failed in Test No. 1 Revealed:

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EDITORIALS

Another Commendable Record

In this issue Electrical World presents its 49th annual review of the status of the electrical industry. This review is presented for the use of those in that industry, but it has a much broader significance. It gives the business world current statistics on one of our country's most important industries—one contributing more and more to the welfare of our country, supplying a vast market for capital goods, and gaining a bigger and bigger percentage of the consumer dollar.

In 1952 Gross National Product reached $346 billion, up 5% over the $329 billion of 1951. The industry maintained its contribution of approximately 6% of this total. Output of electric utilities in 1952 rose to 391 billion from 363 billion kwhr, a gain of 7.7%. Per dollar of GNP output went up from 1.10 to 1.13 kwhr or 3%. Electric revenue increased the same percentage to 1.77% of GNP.

Electric companies alone spent $2.5 billion in 1952 for plants and equipment. This was nearly 10% of the $26 billion spent by all industries. In 1951 the $2.1 billion spent was only 8%. Forecasts for 1953 indicate a further gain in the relative inportance of this industry activity.

Now let us look at other significant trends. The long-term growth trend of 6 to 7% a year in use of electric power seems likely to continue as a minimum for the next few years. Capacity will be added at a more rapid rate. But capacity shortages may persist in some areas.

Transmission line additions showed marked increases with about 75% at 66 kv or higher. However this ratio was the same as in the preceding year. These higher voltage lines and interconnections made necessary a greater percent increase in substation than in generating capacity.

Extensions in urban primary distribution remained constant at 8,500 miles. Rural line additions have been decreasing rapidly as the number of customers receiving electric service has been approaching 100%. Rural lines constructed dropped from 114,000 miles in 1951 to 89,000 in 1952. It is estimated that only 58,000 miles will be added this year.

The decline in new customers reflected the approaching saturation of home electrification. But the use per residential customer grew remarkably. The gain per customer was 171 kwhr which compared favorably with the 174-kwhr gain in 1951, the all-time high. Despite some rate increases revenue per kwhr reached a new low of 2.76¢.

Much more could be written about the significant trends mentioned in this review. Instead we urge that you read the full report beginning on page 133. It is another commendable record for a great American industry.

Liquid Metals for Power

When nuclear reactors are ready to function in lieu of furnace-type steam generators in power plants, there will be a practicable means of transferring the released heat to the steam. That assertion is a justifiable deduction from information presented by engineers of General Electric's Knolls Atomic Power Laboratory.

Either sodium or a sodium-potassium mixture will be the medium, the former in liquid form at the operating temperatures and the latter a liquid even at room temperatures. Both were used in a pilot plant, but either could have been used in both stages provided the user will accept a degree of sacrifice of the good properties of one for the sake of winning the favorable properties of the other. Neither involves much more pumping pressure than water would require because the weights and viscosities are comparable with those of water. It is principally in the relatively low specific heat and greater volume of medium that the greater horsepower for pumping rests.

There need not be worry about corrosiveness provided these working media are kept clean and free of oxygen. Neither will the metals required and their jointing assembly be radically different from that devised for welding high pressure steam piping. If anything in particular needs to be perfected, it is probably the valves and the seals. In fact the valves injected into the pilot plant to facilitate isolation of faulty components were the items that proved prone to failure rather than the components themselves.

Entirely apart from the techniques necessary to safeguard the operators from radioactivity when the liquid metal heat exchanger is coupled to a nuclear reactor (rather than to an electric heater as in the tests) is the matter of temperature levels. Here the temperature of the reactor and in the heat exchangers will be only a few (relatively) degrees above the superheat temperature of the steam. In a conventional boiler the combustion gases are many hundreds of degrees hotter than the steam they serve to generate. Small steps will take the place of one big jump. It appears that utility plant operators will have to revolutionize their views on steam generation.

Is Gas a Solution for the Northwest?

Of all sections of our great country the Pacific Northwest is the most short of fuel. It has no coal, oil, or gas. Its rapid development of the past two decades has been made possible by the extensive use of electricity generated at the many excellent hydro plant sites in the area. But there are few such sites left, and fuel for steam stations is expensive. And the area has been gripped by a power shortage or threat of one for years.

What is the solution to the area's power problem? The Seattle Gas Co thinks the solution is the extensive use of natural gas brought in from other areas. In newspaper space the company is advertising that "Gas is Power." Its president, N. Henry Gellert, in pointing out the advantages of gas over electricity "for thermal use—or heating," says:

"The increasing use of our electricity for thermal or heating needs can only further restrict the electric power available for industrial plants . . . further reducing production, employment, and income."

Gellert favors bringing the gas from the Four Corners section of New Mexico. But there is also a possibility that it can be brought in from Canada. Whether the use of natural gas for home heating, water heating, cooking, and industrial purposes is the solution of the power problem is debatable for a number of reasons. But the suggestion of the gas company does show that it is aggressive and quick to profit by the troubles of the electric power industry.

Now Is the Hour to Act

Work on the first revision since 1941 of the National Electrical Safety Code is underway. This code is becoming more important to the electric utility industry as a standard against which to measure safe construction, operation, and maintenance of electric lines. Today more and more state and local regulatory bodies are adopting the code in full or in part.

Because of the code's importance to the industry all power suppliers and their engineers have an obligation to participate in its revision. Now is the time to study the provisions of the code and to suggest changes which seem desirable. This is your opportunity and obligation.

The revision is being done by the ASA Sectional Committee on the NESC, C2. Any suggestions on proposed changes should be sent to the committee chairman: Mr. A. A. Dickinson, Bureau of Standards, Washington, D. C.

Sell—and Sell—and Sell

What the people want they will buy. There is no floor under any market. It has happened more than once that a "luxury" item, expected to be bought only by those above a certain level of income, has so appealed to those below that level that they found the money to pay for it. And goods whose prices apparently put them out of the reach of many are bought by the same many who have been made to want them by selling. As a matter of cold fact, this spontaneous or induced disposition of the American people to buy what they can't afford is a powerful force in the development of the national economy.

Specific evidence on this point comes from Parker H. Erickson, Bendix Home Appliances sales head. In a talk to distributors and dealers attending the Chicago Furniture Market this month, he said that in 1948 only 12.7% of automatic washer sales were to families with incomes under $4,000. In 1952, the ratio had risen to 29.6%. By 1953 he expects it to be 36%.

There is only one market—the mass market—for goods that make for easier, more convenient living. In this category electric appliances and services rank high. It is a mistake to think that people in lower income groups can't afford, won't buy, any of them. It is correct always to sell—and sell—and sell them.

Noblesse Oblige

"One consumer who was leaving our lines recently indicated considerable concern because he would have to get his electricity from the Ohio Power Co in the future. We were pleased to be able to assure him that the Ohio Power Co is a good dependable company, well qualified to care for his needs. Also, like us, they pay taxes."

Quoted from the "colyum," "Electricity and People" in the January issue of "Co-op Power News," published for members of the Hancock-Wood Electric Co-operative, North Baltimore, Ohio.

THE ELECTRICAL WEEK

The issue's New Highlights—Interior Secretary Douglas McKay's testimony at his confirmation hearing indicates he is not convinced the preference clause is sound policy. He does not favor outright sale of government dams to private companies. He believes the U. S. should go on building multipurpose dams but not a federal power empire.

The power pinch is off the Pacific Northwest, and now suppliers fear industries may not use as much as they did before Depa ordered a 10% cut in firm power.

Indiana & Michigan attributes $1.5-million fire at Tanners Creek Plant to failure in a low-pressure turbine.

Off the Washington Wire—Super priority is in the works for some 56 power generating units which will serve AEC plants. This would mean manufacturers would have top call on all components going into these units. For first time under present controls, a military rating would be given for power plant construction. Rating would practically guarantee these vital units would be kept on schedule.

There is no indication as yet that the Power Authority of State of New York will be in the scramble this year for further power development at Niagara Falls. Bills will be introduced in Congress for a five-company group to construct and operate the facilities and for the federal government to undertake the project.

Ralph Tudor, consulting engineer of San Francisco, is under consideration for a top appointment in the Department of Interior . . . FPC has again found that operation of Bagnell hydroelectric project on Osage River in Missouri does not increase downstream flood damage. Project is owned by Union Electric Co.

Bureau of Reclamation has awarded the final major construction contract for its Canyon Ferry Project near Helena, Mont., and contracts for power generators and turbines for new Chandler Power and Pumping Plant, near Prosser, Wash.

As a departing gesture, former Interior Secretary Oscar L. Chapman recommended that Congress adopt a Bureau of Reclamation plan for development of Trinity River in California. He again asked authorization of the Hells Canyon Project in Idaho.

From New England—An area development department has been formed by Connecticut L&P under Robert P. Lee. It is cooperating closely with New England Council, Connecticut Development Commission, and local chambers of commerce.

From Middle Atlantic—Dexter Hydro-Electric Corp, Limerick, N. Y., is formed to take over electric properties formerly owned by Dexter Sulphite, Pulp & Paper Co.

From East South Central—Kentucky Utilities filed suit in McCracken Circuit Court asking that a Paducah City ordinance calling for an election on proposed purchase of KU distribution system by city be declared invalid.

From Mountain Area—Yampa Valley Electric Association, Inc, Steamboat Springs, Colo., buys properties of Colorado Utilities Corp.

Construction—Georgia Power will spend more than $45 million in 1953, highest in its history . . . Savannah E&P begins five-year program totaling $16 million . . . Idaho Power plans to spend $12.9 million in 1953.

Financial—Prospectuses for five-PUD purchase of Puget P&L are now being passed out. Syndicate includes B. J. Van Ingen & Co. N. Y. Moody's Investors Service has analyzed the bonds and given them a Ba rating.

Dominion Securities Corp group is offering $7.5-million 4½% debentures due 1965 of Province of New Brunswick at $98.25 to yield 4.69%. Funds will be given to New Brunswick Electric Power Commission for refunding of maturing debentures and capital expenditures.

Atlantic City Electric has placed privately $4,050,000 of first mortgage bonds, 3¼% due 1983 and 36,000 shares of 4.35% cum preferred $100 par stock.

Labor—Ohio Edison gets WSB approval to pay increases averaging 12¢ an hour for about 2,000 workers.

Rates—Hawaiian Electric gets Hawaii PUC approval to increase rates $1,125,000 a year as compared with $1,612,320 a year requested.

Key Coal Co and Farrand Coal Co get temporary injunction against State of Illinois from collecting the "Retailers occupational taxes." Companies contend the product they sell to utilities is not actually consumed by the utilities but is a quantity of BTU's of heat which is transformed into electricity, also measured in BTU's, and passed on to the users who are the consumers. Since power customers pay retail sales taxes in the product they buy from utilities, coal companies argue multiple taxes are charged if the coal is taxed. Companies indicate that they will continue to pay the tax under protest.

Dairyland Power Cooperative is installing in its new $500,000 building at La Crosse, Wis., a heat pump which will heat when its cold and cool when its hot.

Congratulations—AIEE presidential nominee is Elgin B. Robertson of Elgin B. Robertson, Inc, Dallas, Tex. . . . Ed Ruisch, assistant to president of Iowa PS, becomes president of Iowa Utilities Association . . . W. R. Grace & Co elects Charles E. Wilson, former GE president and first chief of ODM, chairman of executive committee.

Colorado Fuel & Iron elects H. C. Allington vice president in charge of eastern sales division . . . Commissioner Jerry W. Carter is named chairman of Florida RR & PUC . . . Illinois' Gov Stratton appoints Jesse L. Simpson and George B. Perrine to Illinois Commerce Commission.

Douglas McKay (second from left) listened while Chairman Hugh Butler of Nebraska told EW's Jesse Mock (right) the Senate Interior and Insular Affairs Committee had recommended the appointment of the new Interior Secretary be confirmed

Testimony of the incoming Secretary of Interior at his Senate confirmation hearing gave the nation a . . .

Forecast of New U. S. Policy in Power

There will be shifts in administration of federal power policy once former Oregon Governor Douglas McKay gets down to work as President Eisenhower's Secretary of Interior.

At the recent confirmation hearing, McKay gave some of his thoughts on power policy to members of the Senate Interior and Insular Affairs Committee. This group was described by Chairman Hugh Butler of Nebraska as "very friendly" to McKay. It voted unanimously to recommend confirmation.

Main points of McKay's testimony showed:

- He is not convinced that the preference clause is necessarily a part of sound public policy.
- He believes the federal government must continue to build large multipurpose dams.
- He does not favor outright sale of large multipurpose projects to private enterprise, but has not made up his mind as to whether some interstate agency might undertake the financing of such projects.
- He is not interested in building a federal power empire.

No member of the committee during the hearings expressed antagonism to his appointment to the Interior post. Sen Henry M. Jackson of Washington later said he disagreed with McKay's power views but thought President Eisenhower should have full say in choosing his cabinet.

The new Secretary appeared to be getting a slow start in setting up his top command at the department, but some of the delay was deliberate.

He told Electrical World, "I am in no particular hurry. I expect to be around here several months, and I'd rather go slow in choosing my men."

You get a good indication of how McKay stands on the touchy private power-public power problem in answers he gave at the confirmation hearing. Here are excerpts concerning the main points at issue:

I. Preference Clause

Sen James E. Murray (Democrat of Montana): . . . Now are you in favor of the present system of providing special consideration for rural electrification and for the towns and villages; I mean preference rights for those groups?

McKay: If the people want it; yes.

Sen Henry M. Jackson (Democrat of Washington): . . . You are familiar with the priority clause in sale and distribution of power from federally owned power projects?

McKay: Yes.

Jackson: Do you believe that the existing law should be changed?

McKay: If you want my opinion, I think the situation has been abused. I don't know why customers of one system should be penalized over customers of another system. Now, at the present time the customers of public ownership in the Northwest are getting off better than the customers of private ownership, because the steam-generated electricity is all owned by private ownership that has been fed into the Northwest Power Pool to help the public-ownership customers, and yet who pays for it? The customers of private power, so I think the thing has been abused.

Jackson: But if there is only so much power available in a given area and you have the cities, the REA co-ops, the public utility districts, and other public bodies that need power, isn't it sound public policy that when power is generated from government-owned dams, that it ought to be first sold to public bodies?

McKay: Not necessarily. It is a sound public policy that the citizens all be treated alike.

Jackson: But this is federal property. We have had the preference clause in the sale of war surplus goods and a thousand and one things to municipalities and so on, first.

McKay: Yes, but here in this situation you have people who have no alternative. They have to buy power from the privately owned power com-

panies. Other people have publicly owned power.

Now if that preference is in there, you are unfair to some of the people of the states, because they might want to buy from a publicly owned place, and they can't.

Jackson: That is a matter for local determination.

McKay: I don't think people should be prejudiced by unfair treatment because they happen to favor private enterprise.

Jackson: . . . As I gather your point, it hasn't been stated directly, but I gather you feel that the sale of power from federal dams ought to be on an equal basis with private utilities and public bodies?

McKay: Not necessarily equal, but they ought to have equal treatment. I grant that the publicly owned projects probably ought to have a priority over publicly produced power.

Jackson: You see my point. Then would you say when a license has been granted to a private utility, that they ought to be required, if there is a demand from a municipality or public body for some of that power, that they should be required to dispose of it?

McKay: Sure. They are doing it right now.

Jackson: That goes into the pool, but that is not to give them more power in their own area. That is to conserve the power resources in the transmission lines.

McKay: I think it is for the general good. They are working side by side, privately and publicly owned, to serve their customers, and I wouldn't favor giving anybody's customers a better break than the other people's customers. I am thinking about the consumer.

Jackson: But I take it, Governor, you haven't made any decision as to what your views at the moment are regarding the preference and priority clause?

McKay: No; it is hardly my place. I have my own personal views, but if I am Secretary of Interior, I would, of course, follow the law.

II. Valley Authorities

Murray: . . . Now, with reference to public power, are you in favor of all of the programs of the Bonneville authority?

McKay: No sir. I haven't been in sympathy with the program they have promoted for the Columbia Valley Authority. I am in sympathy with the development of power, and whether it be developed by private enterprise or public power is a matter that is up to the people.

We definitely need the United States Government to develop the Columbia River. Private power can't do it, but I have opposed the part of the federal government in imposing themselves in authority affairs because I think the people at the state level want to retain control of their natural resources.

Murray: I never understood the Bonneville authority was supporting a program for setting up an authority.

McKay: Well, the whole Department was, the whole Department of Interior.

III. Sale of Projects

Murray: Mr (Charles E.) Wilson (formerly) of the General Electric Co some short time ago had an article in which he advocated the turning over of these dams that have been developed by the government to private industry. Do you recall that?

McKay: I recall his statement. Private enterprise should not take them unless they pay for them.

Murray: Are you in favor of turning it over to them on the basis of having them pay for it? Do you think that private enterprise should take over those dams?

McKay: No.

Murray: Do you believe that atomic energy should be turned over to private enterprise?

McKay: Well, I haven't considered that question. It would be just a horseback estimate if I gave it. I think that private enterprise should be allowed to assist in the development of anything that has value to the public in general. I don't think they should be excluded from it.

Murray: Would you be in favor of a system of turning the power over to private industry and not permitting it to be handled in the fashion which it has been in the past, where it has been carried into the interior by transmission lines, so as to make it available at low rates to farmers and municipalities?

McKay: No, that die has already been cast. I don't think you would be allowed to change it, because we have the transmission set-ups in the Bonneville Power Administration, and both public and private power are served by those lines.

Murray: And that would have to continue?

McKay: Oh, yes, it would be a complete reversal, and I certainly wouldn't be one to advocate such a thing. I think we are getting along pretty good the way it is.

IV. Multipurpose Projects

Murray: You believe, then, in continuing the public power policies?

McKay: Oh, yes; sure.

Murray: For the construction of the dams?

McKay: Oh, yes; the construction of the dams. They must be. The only way they can be built, like the big ones, is through the federal government.

Sen Earle C. Clements (Democrat of Kentucky): But you indicated, if you did not say it in those words, that private capital could not have constructed the great dams in the Northwest.

McKay: The multipurpose dams are the main stem of the river, Senator, because the high percentage of it is charged off to irrigation, navigation and flood control.

Clements: As a matter of fact, is it correct that private capital could not have constructed any of the great multipurpose dams in any part of the United States?

McKay: I wouldn't think they could, because they can't collect back for the benefits derived. However, I think likewise some of these single-purpose dams, private capital constructs them cheaper.

V. Empire-Building

Sen Price Daniel (Democrat of Texas): Governor McKay, my experience with the Department of the Interior in the last few years has indicated an attitude on the part of the Secretaries of Interior of trying to build greater and greater domain or empire for the Department of Interior . . . Is it your intention to follow that course of action, or do you feel that the best way for people to be served is by an agency to divest itself of more and more power, have it nearer to the people?

McKay: I am thoroughly in accord with your views on that. I am not interested in building an empire, and I think that the people are entitled to the least expensive government, the best government with the least possible cost, and the simplest.

BIG THREE at general session of winter general meeting of the American Institute of Electrical Engineers were, left to right, Dr H. T. Heald, chancellor, New York University, who made the address; Dr. V. K. Zworykin, electronic expert of Radio Corp of America, who was presented with the Edison Medal; and Donald A. Quarles, institute president, who presided

Zworykin Feted; Heald Speaks

RCA scientist receives Edison Medal at AIEE winter meeting; NYU chancellor calls for government aid for research

Interrupting a lengthy technical program of 83 sessions and symposiums, the American Institute of Electrical Engineers on Jan. 19 held the only general session of its winter general meeting. The session was devoted to:

1. Presentation of the Edison Medal to Dr V. K. Zworykin, vice president of the Radio Corp of America, and of other institute prizes.

2. An address by Chancellor Henry T. Heald of New York University on "Education and Public Policy."

3. A report of institute activities by Donald A. Quarles, president of the institute and of the Sandia Corp, Albuquerque, N. M.

The meeting attracted over 4,000 members or about 10% of the institute's membership. The five day program, Jan. 19-23, included in addition to the largest number of technical sessions ever held at a winter meeting numerous field trips and a number of social events. The meeting was held at New York.

Zworykin Honored . . . President Quarles presented the Edison Medal, the institute's highest award, to Dr Vladimir K. Zworykin, who is technical consultant of the RCA Laboratories Division, Princeton, N. J. The award was made for his "outstanding contribution to the concept and design of electronic components and systems (EW, Jan. 5, p 24)."

The Russian-born scientist said he regarded the honor not merely "as a recognition of my work as an individual. More properly, it is a measure of the impact on present-day society of television, the primary objectives of many men besides myself."

He decried the low quality of many TV programs but noted that "television audiences have become more selective as the novelty has worn off and have exerted their influence in favor of better programs. On the other hand the use of television for educational and scientific purposes is being expanded rapidly."

Other Prizes Awarded . . . Technical paper awards were made to 14 electrical engineers and three students. In the Power Division first prize went to R. A. Baudry, P. R. Heller, and H. K. Reamey, Westinghouse Electric Corp, East Pittsburgh. Second went to Paul H. Jeynes, Public Service Electric & Gas Co, Newark.

Chancellor Heald Speaks . . . Much of Chancellor Heald's address dealt with the relationship of the federal government, the armed forces, science, and education.

"It should not be forgotten," he said, "that education played a major role in the winning of the war. Its scientists and engineers, working in their laboratories across the nation, were responsible for many technological developments that hastened the end of the conflict and saved thousands of human lives. Furthermore, this research, spurred on by the urgency of war, had an indirect benefit to higher education. It enabled many colleges and universities to keep the core of their research staffs intact, and it helped tide them over the low income period of declining enrollment.

"I am certain that it is in the public interest that the government continue to support substantial research activity in a variety of fields. Scientific and technological progress is our best assurance of keeping ahead of our potential enemies. A reduction in expenditures for research is not a good or safe way to balance the national budget."

The NYU educator rejected a federal scholarship program for three reasons. "First, I think we should not add more federal expenditures to our already overloaded national budget. Second, we are in effect now committed to a federal scholarship program through the second GI bill and the ROTC program. And third, I still believe that scholarship aid should, in general, be handled at the local level."

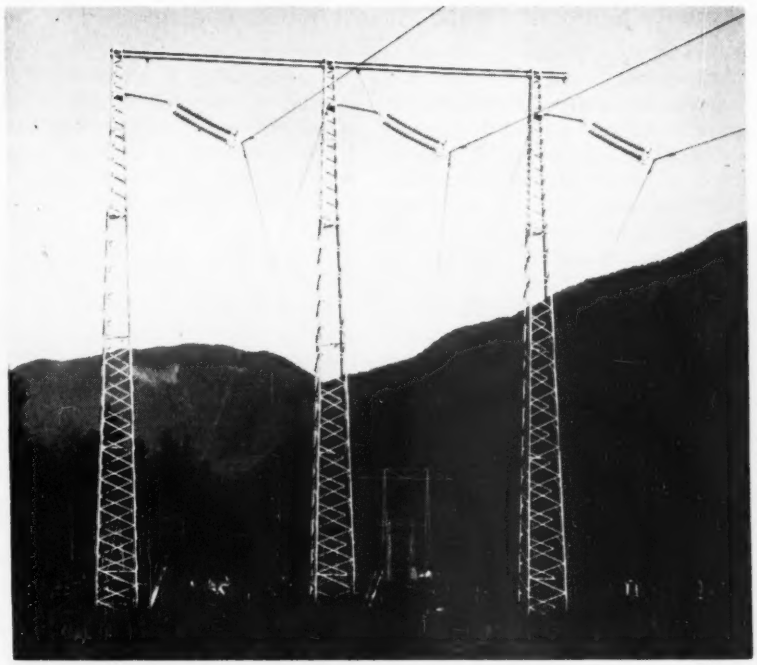
Hibshman on Headquarters Staff . . . President Quarles announced that Nelson S. Hibshman, dean of engineering at Pratt Institute, Brooklyn, and long active in institute affairs, is now serving full time as assistant secretary. He is expected to succeed Secretary H. H. Henline upon his retirement next year.

Under the new constitution of the Engineers Joint Council AIEE will receive additional representation on the council. President Quarles also reported on the difficulties of securing or constructing another headquarters building.

B. C. Electric Completes 345-Kv Line

The continent's first transmission line built to carry 345 kv went into operation recently with the opening of British Columbia Electric Co's Wahleach Plant on the Trans-Canada Highway about 80 miles from Vancouver. Initially the line is carrying 230 kv.

The power station has a single 60,000-kw unit of the vertical shaft type driven by an 82,000-hp turbine.



TRANSMISSION LINE from British Columbia Electric's Wahleach Plant to Vancouver is first to be built and insulated for 345-kv on this continent. Initial operation is at 230 kv

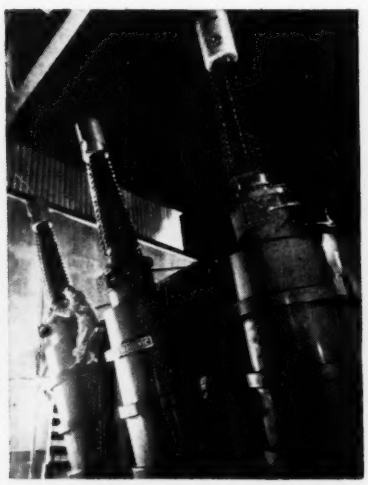
Tower Design . . . The transmission line uses a bundled-conductor construction with two 795,000-cir mils ACSR conductors spaced 18 in. apart for each phase. (EW, May 26, p 32). The towers consist of two latticed masts, joined by a cross-arm, the underside of which is 85 ft above the ground. The cross-arm is 74 ft long giving a spacing between conductors of 35 ft.

The design was chosen as it requires a minimum of tower steel, each tower above the foundations weighing only 15,000 lb. The upper section of each mast is of welded construction and the lower section bolted. Each mast was assembled on the ground and then hoisted into position by a truck-mounted crane equipped with a 75-ft boom.

The line runs 65 miles down the Fraser Valley to Vancouver, and is designed to carry, eventually, power from a second line from the Bridge River project through the Fraser Canyon when that project is raised from three to four or five units.

Two Dams . . . Wahleach Plant draws its water from Wahleach Lake, the water finally flowing from the plant into Fraser River. Two dams are used to back up the lake water. A small dam (650 ft long, 8 ft high) diverts Boulder Creek into the lake, while the larger main dam (1,375 ft long, 55 ft high) backs up Wahleach River.

Work on the dam will not be complete until next summer because of weather interruptions since start of construction in January, 1951. The project will operate on water from stream flow until then.



MAIN TRANSFORMER at the Wahleach Plant steps up current from 13.76 to 230 kv

PRINCIPAL DAM for the Wahleach project is as yet uncompleted. Water reaches the plant through an underground penstock tunneled through a mountain at 48 deg to the horizontal

AEC Increasing TVA's Load

In its annual report, authority attributes rise in power demands to atomic plants. Agency will double capacity by '56

Tennessee Valley Authority has construction under way which will more than double the installed capacity of its power system by January 1956. In its annual report for fiscal 1952 the authority says that is will have 9.6 million kw by January 1956 compared with 3,859,910 kw at the end of June 1952.

The federal agency listed the Atomic Energy Commission as the greatest single factor in the sharp rise in demand for power in the region. AEC is expanding facilities at Oak Ridge, Tenn., and is building a plant at Paducah, Ky. Total amount of TVA power to be used by AEC will be 24 billion kwhr a year, TVA said.

Increasing Demand . . . TVA expects power demands in the region, including AEC, to reach 59 billion kwhr by 1956. In fiscal 1952, demands totaled 23 billion kwhr and in 1945 12.6 billion.

During fiscal '52 TVA carried on construction on five steam plants, two dams, and new generating units at seven existing dams. And shortly after the close of the fiscal year Congress authorized two additional steam plants, bringing the total under construction to seven.

During the year system generating capacity was increased by 678,800 kw. Two-thirds of the increase was accounted by initial operations of the first four 112,500-kw generating units at Johnsonville Steam Plant. The plant will have six units when completed.

Also going on the line were new generators of 24,300 and 27,000-kw capacity at Guntersville and Chickamauga Dams, and four 25,000-kw units at Wolf Creek Dam. Wolf Creek is an Army Corps of Engineers' project from which TVA purchases power.

Sales Up 22% . . . TVA power sales in fiscal '52 totaled 20.2 billion kwhr, a 22% increase over the previous year. Total operating revenues for '52 came to $95 million compared with $70,330,000 for '51.

Net revenue for power operations during the year amounted to $25,839,000, representing a return of 4.7% on the net average investment in power facilities. Average annual return over the past 19 years of operations has been 4.3%, TVA reported. TVA paid $7 million into the general fund of the U. S. Treasury in 1952 and $5 million was used to retire bonds.

The authority reported the continued growth of the use of electricity. The average residential consumer in the TVA area used 3,907 kwhr during the year compared with a national average of 2,091 kwhr. And the average cost per kwhr for residential service was 1.35¢—less than half the national average cost of 2.78¢—according to TVA.

20-Year Gains . . . TVA devoted a good part of its report to its accomplishments over the past 20 years. The agency pointed out that industrial expansion in last two decades has been more rapid in its area than in any other part of the nation in terms of both income and employment. The growth of industry, TVA said, is bringing about a better balance with agriculture in the region. In 1929 23% of the region's income came from agriculture and 15% from manufacturing. By 1950 manufacturing accounted for 20% of the income and agriculture 13%.

Chapman, Leaving Office, Rejects Provo Proposal

Just a few days before leaving office, former Interior Secretary Oscar Chapman turned down a plan offered by Provo River Water Users Association to install a 5,000-kw generating unit at the Deer Creek, Utah, reclamation project.

It had been contemplated that Utah Power & Light Co would install the unit and lease the plant, but directors of the association indicated this was tentative. At a public hearing in Provo Dec. 11, counsel for the association had said, the directors were asking "for the right of the . . . association to conduct its own business without interference from anybody."

Funds for adding the power unit are included in the budget for fiscal 1954 (EW, Jan. 19, p 6).

New Interior Secretary Douglas McKay could reverse this decision and withdraw the item.

Reasons for Chapman's action:

- The association's proposal does not necessarily guarantee that power from the project would go first to preference customers.
- It does not guarantee any specific net remuneration and makes use of project water for irrigation and municipal, subservient to power product.

Tanners Creek Fire

Indiana & Michigan attributes $1.5 million blaze to failure in low-pressure turbine

Fire attributed to mechanical failure in a low-pressure steam turbine shut down the 300,000-kw Tanners Creek Plant of Indiana & Michigan Electric Co on Jan. 9.

Vibration set up by the damaged rotor snapped pipes carrying lubricating oil which ignited on contacting steam pipes, a company spokesman said. An estimated 1,500 gal of oil burned.

First indication of trouble was "thumping" in the low-pressure turbine of the 150,000-kw Unit No. 1. The unit was tripped immediately. But before the 1,800-rpm machine stopped spinning it was enveloped in flames. Unit 2, identical to No. 1, was shut down as a safety precaution as smoke poured through the building. In spite of the 300,000-kw loss, reserve capacity and interconnected neighboring utilities enabled the AG&E system to maintain service.

Maintenance crews hope to have repairs completed in 10 weeks.

Investigation determined that a breakdown in the first-stage integral forged wheel in Unit 1 low-pressure turbine initiated the trouble. The disturbance snapped the oil pipes and cracked the governor housing.

The masonry-and-steel building suffered minor damage from the fire. Unit 2 was returned to service after 16 hours. Personnel not involved in operation or fire-fighting were evacuated safely, but an assistant shift operating engineer was overcome by smoke. Company officials estimate the total damages at $1.5 million.

GOP Faces First Power Test

McKay's action on Georgia Power proposal to distribute Clark Hill energy will reveal Republican marketing views

First test of the Republican Administration's views on federal power marketing policy may come when Interior Department decides on a contract offered by Georgia Power Co. Departing Democrats turned down the limited "wheeling" offer with "deep regrets."

Policy question presented is: Must public bodies given preference in purchase of power from federal projects be direct customers of the government?

Fights for Customers . . . Fighting to keep its hard-won customers, Georgia Power has had tough going during three years of negotiations with former Interior Secretary Oscar L. Chapman. (EW, March 10, 1952, p 92). With the first energy from Clark Hill Dam already on the line, some sort of transmission arrangements will have to be made if Georgians are to get their share of the government produced electricity.

Chapman held that preferred purchasers must be customers of the government. To get the power to them, he relied either upon simple "wheeling contracts" or upon government-built transmission lines. He attempted to make "bus bar" sales a bygone practice, and was hugely successful.

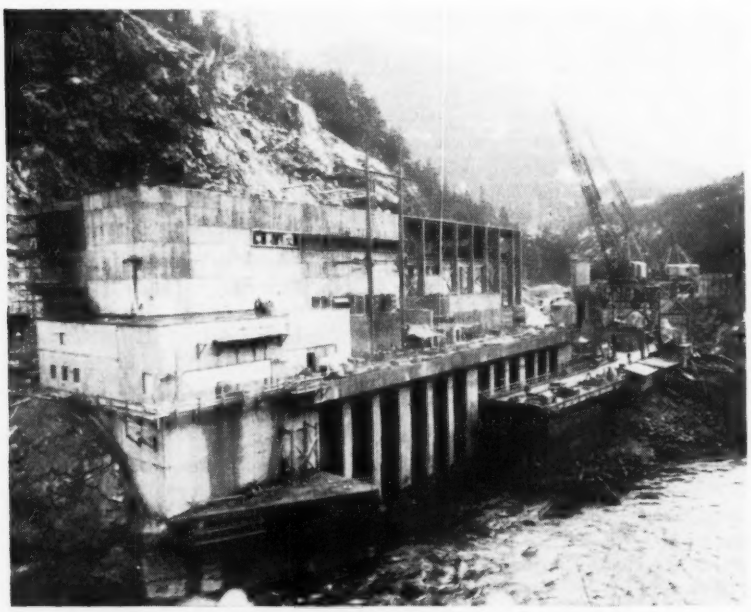
Georgia Power's Offer . . . Georgia Power's offer does not fall into any of these neat categories. It contemplates the company will buy and take into its system at Clark Hill all power which Interior allocates to Georgia. It will deliver to preference purchasers in Georgia energy less losses, equivalent to the full firm marketable power available from the plant. The preference purchasers designated by Interior would, of course, remain the customers of the company.

Terms of this unusual contract were so attractive that a number of preference purchasers in Georgia have indicated approval. Transmission costs would be approximately one-fourth mill per kwhr—cheaper than any regular "wheeling" rate ever offered.

Low Rates . . . One of Chapman's power advisers said the proposed rates would be so low as to preclude the possibility of any preference customer ever being able to justify asking for service directly from the federal government.

In a pointed reply to Chapman's turn-down, Georgia Power lamented, "this is the first time, to our knowledge, that the proposal of a private electric utility has been condemned by federal officials because it produces too low rates for power."

New Interior Secretary Douglas McKay already has full briefs from both the company and Chapman.



Ross Plant: One On, Three to Go

Seattle City Light is now installing the second of four 90,000-kva generators at its partially completed Ross Plant on the Skagit River in Washington. First unit went on the line Dec. 30. It was limited to an output of 70,000 kva by low water conditions

Zoning Commission OK's Manresa Island Plant

Connecticut Light & Power Co has won the approval of the Norwalk Zoning Commission to locate a steam plant on Manresa Island, offshore from the city.

The construction of the plant has been bitterly opposed by some civic groups and Norwalk's mayor. The 3-to-1 decision of the commission was announced Jan. 19. Greater Norwalk Improvement Association, representing shorefront groups and residents, immediately made known its intention of filing a court action to block construction of the plant.

In granting permission for construction of power station, the commission listed 23 specific restrictions on operations of the plant. These deal with the location and method of storing and handling coal, the discharge of flyash, and pollution of the water of Long Island Sound.

The zoning commission cited need for additional power in the area and Connecticut L&P's right to locate the plant on Manresa Island in making an affirmative decision on the company's petition.

Opponents of the plant will contest the legality of the commission's action on four grounds: Constitutionality of statute under which the application was filed, jurisdiction of the Zoning Commission over location of the plant, validity of appointments of the members of the commission, and the conduct of the hearing.

N. KNOWLES DAVIS

Davis Wins Pool

Georgia PSC engineer's output estimate in Hatfield kwhr contest is off only .006%

The chief engineer of the Georgia Public Service Commission, N. Knowles Davis, is the nation's foremost power production estimator. He won the honor by placing first in Bob Hatfield's 1952 Kwhr Power Generation Pool. Davis estimated 1952 production at 399,399,000,000 kwhr, within 0.006% of the correct figure of 399,374,000,000 kwhr (See p 161). He was closer to the total than any winner in the previous six contests.

I. C. Steele, winner of the 1951 pool, was second. The former vice president of Pacific Gas & Electric Co, now a consulting engineer located at Piedmont, Calif., guessed 399,330,000,000 kwhr. R. F. Brower, assistant vice president of Consolidated Edison Co of New York, was third with his 399,250,000,000 kwhr estimate.

Beats Out 293 Others . . . In winning Davis beat out 293 other contestants including 26 utility company presidents. Entries came from 93 utilities, 10 consulting engineering firms, 11 equipment manufacturers, and 4 government agencies in 38 states and the District of Columbia.

The figure obtained by averaging all guesses in the contest came within 0.6% of the actual figure. This was a slight drop from 0.4% of the 1951 contest. But it indicates that the pool average is still the best prediction of power production.

Other winners were as follows: Fourth, C. W. E. Clarke, United Engineers & Constructors; fifth, K. W. Irwin, Philadelphia Electric Co; sixth, A. G. Skina, Commonwealth Services, Inc; seventh, P. R. Courtney, Metropolitan Edison Co; eighth, V. J. Hayes, Connecticut Light & Power Co.

The top eight contestants all were awarded the honorary degree of "Master in the Art of Load Forecasting."

Hatfield works for Combustion Engineering-Superheater, Inc, at its Los Angeles office.

Florida P&L, City Ask Dismissal of Co-op Suit

Motions have been filed by Florida Power & Light Co and the city of Jacksonville asking dismissal of a federal court suit brought by Okefenokee Rural Electric Membership Corp against them.

The Rural Electrification Administration co-op filed suit in December asking triple damages of $840,000 under the Sherman Anti-Trust Act charging Florida P&L and the city with forming a conspiracy to block co-op lines from Kingsland to customers in Yellow Bluff area. The co-op alleged that a road block had been thrown up along U. S. Highway No. 1.

Florida P&L asked that the suit be dismissed because it failed to state a claim on which relief could be granted.

Motions for the Jacksonville and J. D. Kennedy, city utilities commissioner, also named in the suit, pointed out that the city had a franchise to serve Duval County and adjoining counties and had the right to place lines on right-of-way public roads long before the co-op began to operate.

Gov Warren Asks Funds for Feather River Study

Gov Earl Warren has asked the California legislature for $750,000 to further studies on the proposed $1-billion Feather River water and power project. Of that amount, $125,000 is scheduled for the negotiation of contracts for the delivery of irrigation water and electric power.

The new appropriation would be in addition to $800,000 being spent on Feather River investigations during the current fiscal year. The state-sponsored project would include a dam and power plant on the river near Oroville, with a system of canals to carry water to Southern California.

KW Pinch Off in NW

But suppliers fear power consumption will not return to pre-shortage levels

Power suppliers in the Pacific Northwest feared electric consumption might not climb back to normal levels despite Defense Electric Power Administration's order restoring the cutback in firm power and improved water conditions which are allowing partial restoration of interruptible loads. A strong possibility remained demand would not take up all the sudden surplus.

Aluminum companies were on the way toward picking up their former usage, but in other categories it looked as if use of electricity might fall off. In Seattle, City Light said it felt certain that future power consumption would be lower than it was before the shortage. Firms like the Boeing Airplane Co, which had to cut 10% by plant-wide curtailment (by turning out most of the lights in halls, cafeterias, etc.) is unlikely to use as much power as it did before the cutback order.

Interruptible Loads Picked Up . . . Early last week Bonneville Power Administration reported interruptible customers had taken back 70,800 kw and scheduled 79,000 more for midweek. Aluminum plants had returned 67,100 kw to their lines and planned to add 31,000 in midweek.

Doubts about reduced demand brought into focus aluminum stockpiling contracts held by the region's big smelting plants and the surcharges private utilities are levying on customers to pay off high cost steam generating expenses accumulated during the shortage.

Under Defense Production Authority stockpiling agreements the government has agreed to pay for any excess power charges over 4 mills per kwhr. When ample hydro power is available the interruptible loads are delivered at about 2 mills per kwhr. But in the present situation, with public and private utilities having prior claim to federal hydro generation, the 200,000 kw available for restoration of production must come from steam plants, and the cost ranges up to 12 mills per kwhr. Mills holding stockpiling quotas must obtain DPA approval for government payment of any charge over 4 mills.

MEETING REPORT

Safety Is Management's Job . . .

. . . E. L. Godshalk tells Edison Electric Institute Accident Prevention Committee meeting in Kansas City

The best employees are the most safety-minded employees, E. L. Godshalk said at Edison Electric Institute's Accident Prevention Committee meeting Jan. 12-13 at Kansas City. And it is the job of company managers to make employees safety-minded, the vice president of Kansas City Power & Light Co emphasized.

Godshalk said the utility business is attended with some degree of risk and danger and no reckless, careless, or indifferent person should be entrusted with its handling. He pointed out that the company with the good safety record is one in which the executive attitude toward safety is "not faint support, not nodding support, not puny support but enthusiastic support, active support, energetic support, wholehearted support."

Growth of the industry, he added, is multiplying the opportunities for accidents. "Safety must be our business," he said.

Suggests Program . . . Official stress on safety within EEI came from W. W. Lynch, president of Texas Power & Light Co and chairman of the EEI board's subcommittee on safety. He suggested the setting up of quantitative measures of the successfulness of safety programs so that the below-average companies could improve their programs and their records through learning how to apply the lessons from the statistics of frequency and severity rates.

Lynch also recommended that attention be given to the common experience that fatalities involving the public and utility facilities are three times as frequent as those involving utility employees. The public needs to be informed of hazards of interior wiring, and of poorly installed and poorly located television antennas, he said.

Half the electric utility customers in a 10,000 population town some 50 miles from a telecasting station in Ohio have television receivers according to survey by Ohio Edison Co (reported by P. M. Gentzel) and of these 7% were deemed hazardously near power wires.

Fatality Statistics . . . Statistics cited by the committee's chairman, W. F. Brown, Consolidated Edison Co of N. Y., still show one fatality annually for each 2,000 employees with an annual loss of 1 million days. S. H. Young, Hartford Electric Light Co, added further data to show that 71.1% of the industry's 1,466 fatalities in 11 years are attributed to electric shock or burns. For 1951 the percentage was 73.3%. Total fatalities (165) in 1951 were exceeded only in 1947 and 1949 (173 and 176 respectively). Hand, arm and body contacts remain distressingly constant; only head contacts decreased in 1951.

Climber-iron gaffs are essentially chisels and must be so shaped, sharpened, and angled as to "dig into" the wood by "push" without "drive." Otherwise a cutout can almost be certain, said C. H. Weiser, plant personnel advisor of Southwestern Bell Telephone Co. The gaffs should dig in even if the leg iron is held parallel with the pole and Weiser showed by film and by table demonstration that a 10 deg gaff angle is far superior to 5 deg for this purpose. A blunted gaff is an almost certain consequence of a lineman walking around with his climbers on. Sharpening should retain as much metal as possible back of the working edges, sides as well as point, he said.

Computation Discrepancies . . . Variations between utilities in computing the manhours of exposure to use as divisor in determining their frequency and severity rates can make as much as 10-15% difference in these indexes, Chairman Brown told the meeting. Sentiment was that EEI member companies need not wait for ASA agreement in order to resolve these discrepancies and establish a sounder basis for comparative listing.

Much interest was manifested in the report by R. E. McCann, Southern California Edison Co, that the 23 member companies of Pacific Coast Electrical Association had succeeded in devising uniform safety rules.

No increase of rubber sleeve sales had been observed by T. R. Claffey, W. H. Salisbury Co, since the committee went on record favoring their use. Claffey reported that the anti-corrosion compounds used with aluminum joints generally have slight effect on rubber gloves but do affect leather.

Papers on Sales, Taxes Highlight EERA Meeting

Presentation of papers devoted to sales and taxes highlighted the annual meeting of the Electrical Equipment Representatives Association held Jan. 8-10 at The Whitehall, Palm Beach, Fla.

The paper entitled "Sales" was presented by F. E. L. Whitesell, formerly vice president and director of sales for Burndy Engineering Co. "Federal Income Taxes" was the topic covered in the paper offered by Paul R. Smoak, senior member of the accounting firm of Smoak, Davis, & Nixon, Jacksonville, Fla.

EERA elected the following new officers for 1953: Earl S. Condon, Earl S. Condon Co, Los Angeles, president; Richard A. Kent, Richard A. Kent Co, New York, executive vice president; Howard Peterson, Peterson Co, Denver, second vice president; Marvin R. Horne, George R. Horne & Co, Dearborn, Mich., secretary; Edward W. Verbarg, Bergstrom-Verbarg Co, Minneapolis, treasurer; and Edwin C. Minteer, executive director.

The association voted to hold a summer meeting next July at Colorado Springs, Colo. ERRA also voted to hold its next annual meeting at Los Angeles in February, 1954.

Blast Forces Brownout

Power consumers in northeastern Alberta were forced to cut down on their use of electricity for a few days as a result of an explosion at the Vermillion power plant of Canadian Utilities. The blast occurred Jan. 14 and the company appealed to its customers to curtail power use until repairs could be made at the plant and full operations restored.

POWER BRIEFS

● New York State has asked the Appellate Division to rule it has sovereign rights to Lake George. The state contends these rights are being violated and interfered with by a 107-ft power dam across Ticonderoga River at the northern end of the lake. The dam is operated by Eastern New York Power Corp. In arguments before the court, New York claimed the dam is causing destruction and erosion of state-owned islands. The company countered that a lower court has correctly upheld its title to the dam.

● Orange & Rockland Electric Co has installed a mobile two-way radiotelephone system covering its entire service area and connecting service vehicles with two transmitting points in Monroe, N. Y.

● Factories, stores, and apartment houses in Britain may now use private power facilities to generate electricity. British Electricity Authority has directed local electricity boards to remove restrictions in contracts with consumers which prevented them from using their own facilities or limiting use to certain hours.

● Gandhidham, India, boasts that it is the only Asian community that is 100% electrified. The town of 15,000, which is only two years old, is composed of Hindu refugees from Pakistan. Gandhidham means Gandhi's town.

● Communist news agency in the Russian Zone of Germany recently announced a power breakdown in many parts of the zone. The outage was attributed to a short circuit in one of the main power plants. Repair work was delayed but the news agency did not say how long power service was disrupted.

● A recent 15-hour outage affecting Wardensville, Capon Strings, and Yellow Springs, W. Va., has been attributed to a stray shot from a hunter's rifle. The shot damaged the transmission line from Strasburg.

● When Iowa Public Service Co opened the current transformer box to change currents at the Hampton High School football field they found the premises occupied—by a swarm of bees. Carbon dioxide from a fire extinguisher brought the situation under control by freezing the bees temporarily. When the freezing effect wore off the bees came back to life but not until the current transformers had been changed.

● Delaware Power & Light Co plans to spend more than $16 million this year to expand and improve generating, transmission, and distribution facilities in its system. Included in the expansion plans is installation of a third unit at the Edge Moor Station. The unit will have a capability of 78,000 kw and is scheduled for completion late in the fall of 1954.

● A young chemical engineer who was graduated last June from Cooper Union School of Engineering has received the A. McLaren White award of the American Institute of Chemical Engineers. The award was for the design of an atomic power system. Hublein is employed as field development engineer for E. I. duPont de Nemours & Co.

● Consumers Power Co, Jackson, Mich., has won National Safety Concil's highest award, the Award of Honor, for improvement in its 1951 safety record. The '51 safety record showed a 51% improvement in accident frequency and a 68% improvement in accident severity.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING NOVEMBER

State	Utility	Plant	Fuel	Capacity (kw)
Me.	Bangor Hydro-Electric Co	Edward M. Graham	S	6,000
Me.	Central Maine Power Co	Mason	S	30,000
Mass.	Western Massachusetts Electric Co	West Springfield	S	50,000
N. Y.	Long Island Lighting Co	Glenwood	S	99,000
N. Y.	Niagara Mohawk Power Corp	Stewarts Bridge	H	30,000
N. Y.	Niagara Mohawk Power Corp	Albany	S	80,000
Ohio	Dayton Power & Light Co	O. H. Hutchings	S	60,000
Ohio	Celina Municipal Electric Department	Celina	S	3,000
Ohio	Ohio State University	Columbus	S	3,500
Ind.	Indiana & Michigan Electric Co	Tanners Creek	S	125,000
Mich.	U. S. Army, Corps of Engineers	St. Mary's Falls	H	2,000
Iowa	Iowa Electric Co	Fairfield	IC	1,000
Iowa	Northwestern Light & Power Co	Sibley	IC	1,136
Iowa	Iowa Public Service Co	Whitney	IC	627
Neb.	Sidney Public Utilities	Sidney	IC	2,160
Neb.	Wahoo Municipal Light & Water Works	Wahoo	IC	2,000
Neb.	Wayne Water & Light Department	Wayne	IC	1,200
Va.	U. S. District Engineer	J. H. Kerr	H	32,000
Va.	Danville Water, Gas & Electric Department	Brantley	S	11,500
Ga.	Georgia Power Co	McManus	S	40,000
Fla.	Florida Power & Light Co	Cutler	S	56,470
Fla.	Florida Power Corp	Avon Park	S	40,000
Fla.	Key West Utility Board & Electric System	Key West	S	10,000
Tenn.	Tennessee Valley Authority	Johnsonville	S	112,500
Ala.	Tennessee Valley Authority	Widow's Creek	S	112,500
Ark.	U. S. Army, Corps of Engineers	Bull Shoals	H	80,000
La.	Central Louisiana Electric Co	St. Landry	S	20,000
Okla.	Ponca City Water & Light Department	Ponca City	IC	3,040
Idaho	Washington Water Power Co	Cabinet Gorge	H	50,000
Wash.	Tacoma Department of Public Utilities	Cushman No. 2	H	27,000
Calif.	Pacific Gas & Electric Co	Moss Landing	S	112,500

PLANT RETIREMENTS DURING NOVEMBER

Pa.	Northern Pennsylvania Power Co	Muncy Valley	H	175
Pa.	Pennsylvania Power & Light Co	Pocono Pines	H	48
Pa.	Pennsylvania Power & Light Co	Bennett	S	2,000
Mich.	Consumers Power Co	Morley	H	150
Mich.	Consumers Power Co	West Branch	H	75
Mich.	Consumers Power Co	Montague	IC	3,480
Mich.	Clinton Municipal Light & Water Department	Clinton	IC	235
N. Mex.	Public Service Co of New Mexico	Bernallillo	S	5,000
N. Mex.	Public Service Co of New Mexico	Prager	S	3,000
Nev.	Ely Light & Power Co	Ely	H	45

H—Hydro, IC—Internal Combustion, S—Steam

United States Capacity as of Dec. 1—Hydro, 20,016,865 kw; Internal Combustion, 2,100,997 kw; Steam, 58,793,002 kw; Total, 80,910,864 kw.

WASHINGTON COMMENT

JESSE MOCK

Federal Power—Is There a Way Out?

Federal power agencies such as Bonneville Power Administration have well publicized their contributions to the national economy in time of crisis. Less well known is that these agencies, themselves, owe much of their expansion to the same series of emergency situations.

BPA administrator Paul J. Raver put it succinctly in a statement last December: "National emergencies of one kind or another have been responsible for much of the financing already done under the existing appropriations process."

Congress Controls the Pursestrings . . . Agencies such as BPA and Tennessee Valley Authority have put themselves in such a situation as to be mainly responsible for meeting the power needs in their areas. To fulfill this responsibility, they must depend upon direct appropriations from the federal treasury. Since Congress controls these pursestrings, the amount of the year-to-year appropriations may depend as much on political or national economic considerations as on the power demand in the area.

Because of the recurring crises, both TVA and BPA fared pretty well under the helter-skelter appropriations process. But power experts in both agencies will tell you in a polite way that it is a dickens of a way to run a power system.

Challenge facing the Republicans who now control the federal government is to formulate a domestic policy that depends less on the recurring crisis. Preliminary steps have already been taken in the case of BPA. Within the next year or two, the GOP may be on the way to solving the thorny appropriation problem.

By-products of this solution may be even more important than the solution, itself. If discussions now underway are productive, the Republicans may at least hit on a constructive alternative to another TVA—one which diminishes the financial control that Washington now exerts over electric power in the Northwest.

Senator Cordon Has a Plan . . . Republican Senator Guy Cordon of Oregon has been working part-time on this plan for several years. Some suggestions were given by Dr Raver before the Bonneville Advisory Council in December (EW, Dec. 29, 1952, p 52). In essence, the plan calls for local control and financing of power development, transmission, and marketing in the Pacific Northwest. A regional agency set up for this purpose would issue revenue bonds to finance the generating and transmission facilities required. It would presumably build and operate these facilities and market the power. The present BPA would cease to exist under such a setup. Federal money would still be needed but to a much less extent than under the present system.

Despite the fact that such a changeover might raise present wholesale power rates in the area by 50 or even 100%, the suggestion put forward by Dr Raver brought numerous favorable comments from newspapers in the area.

There appears to be an acute awareness in the region that a more orderly scheme of power expansion is needed than can be secured through federal appropriations. Then there is also a strong feeling of independence in this new West. People don't relish having their electrical power supply governed by absentee financiers in Washington.

Raver's remarks were confined to some of the operational problems involved in the regional-control plan. There are political problems which promise to be much tougher to solve. One things is certain. Senator Cordon, who has taken the lead in formulating the plan, will not go off half cocked in presenting it to Congress or other appropriate federal bodies. He works deliberately and painstakingly. He is aware the plan now is in no shape for formal presentation.

There are numerous problems that must be threshed out among the people most affected. But when Cordon is convinced that he has a workable plan, it will be forcefully brought to the attention of the Republican Congress and administration.

In view of this, alternate proposals for solving the Bonneville problems should be put in the hopper before too long.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Transient recovery voltage rise at the generator is practically linear and is not therefore governed by the subsequent periodic oscillation. It appears to be composed of an infinite number of oscillations with aggregate amplitude of one.

Transient overvoltages in surge testing of transformers are reduced by connecting the incoming lead to the mid-point of the high-voltage winding.

Control cable desiderata: low water absorption, high insulation resistance, high dielectric strength, low dielectric constant, good aging and stability.

Temperature of the Mahoning River rose to 140 F in December due to its use 10 times over for cooling purposes by the industries along its banks.

Chlorinated rubber protective coatings must contain resins and plasticizers in order to present maximum resistance to corrosion by acids, alkalies, salt, etc.

Failures of power transformers over a 5-year period averaged only 0.4% annually on a system with 1338 in service. Sludge was found in only 30% of the failures and even then no ducts were clogged.

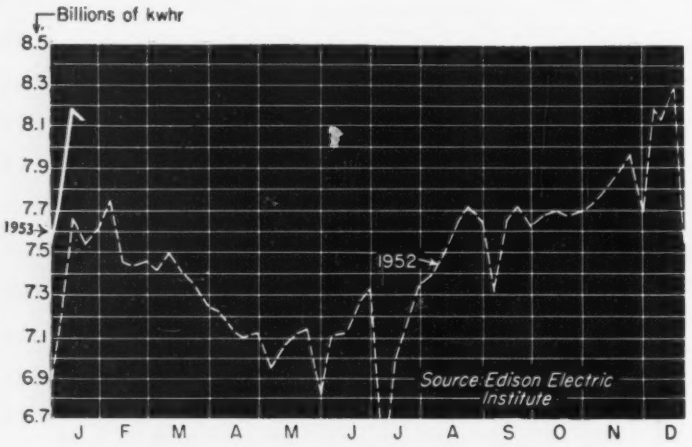
Socket meters attached directly to clapboards may become recessed if the house owner decides to add shingles later. A mounting board would obviate the later difficulty.

Total plant personnel for 4 units in a recent plant (including supervisors, technicians, office, janitors, maintenance and yard crews as well as operators) amounts to 0.34 man per Mw.

Splices in control cables carried on trays are generally to be avoided if there are several cables, especially in layers.

Bentonite-magnesium sulphite backfill enhances the efficiency of a magnesium alloy anode for corrosion prevention.

STATISTICS



Output Week Ended Jan. 17—8,121,357,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	SW
Jan. 17	+7.7	+10.0	+6.2	+10.2	+10.4	+15.6	+6.1	+4.0	−14.8	+4.9
Jan. 10	+6.8	+10.0	+4.4	+10.2	+9.8	+12.0	+6.9	+3.0	−12.2	+3.5
Jan. 3	+7.9	+12.7	+6.4	+9.6	+7.8	+16.9	+4.1	+5.4	−11.5	+4.5

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Oct.	70.8*	69.8	66.0
Capacity (Million Kw)	Nov.	80.91	79.70	75.18
Production (Billion Kwhr)	Nov.	33.75	34.82	32.10
Hydro		6.52	7.02	8.08
Fuel		27.23	27.80	24.02
Fuel Consumption				
Coal (Million Tons)	Nov.	9.93	9.92	9.74
Oil (Million Barrels)		7.75	7.16	5.96
Gas (Billion Cu Ft)		69.94	83.08	53.15
Sales (Billion Kwhr)	Oct.	30.15	30.11	27.68
Residential		7.72	7.66	6.85
Commercial		5.09	5.37	4.65
Industrial		15.16	14.75	14.13
Other		2.17	2.33	2.05
Net Income Class A & B Companies ($ Million)	Nov.	94.18	64.86	69.92
Estimated Dec. 52 Peak (Million Kw)	Oct.	79.1	79.7	80.6
Kwhr per Residential Customer (12 Month Average)	Oct.	2,143	2,131	1,972
Revenue per Kwhr Residential Service (12 Month Average)	Oct.	2.77¢	2.77¢	2.83¢
Canadian Production (Billion Kwhr)	Oct.	5.42	4.99	4.92

Business Statistics

FRB Industrial Production Index†††	Nov.	234	233	220
Gross National Product Annual Rate ($ Billion)	3rd Qtr.	343.4	342.6	337.1
E. W. 5 Industry Production Index	Nov.	128.3	127.4	122.1
ENR Construction Cost Index††	Dec.	123.2	123.4	114.8
BLS Consumer's Price Index	Oct.	190.9	190.8	187.4
NEMA Insulation Materials Sales Index†	Nov.	579	599	511
NEMA Electric Appliance Sales Index†	Nov.	251	260	269
NEMA Household Refrig. Sales Index†	Nov.	152	122	87
Metal prices, (Jan. 19)				
Copper, Conn. V., lb		$.24½	$ .24½	$ .24½
Lead, N. Y., lb		.14½	.14¾	.19
Zinc, prime Western E. St. Louis, lb		.13	.12½	.19½
Tin, Straits, qual. N. Y. lb		1.21½	1.21½	1.03
Aluminum, ingot, base price		.20	.20	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

'53 Plant & Equipment Spending—$26 Billion

American business is planning to continue capital outlays in 1953 at approximately the same high rates as in 1952 and 1951.

This is according to a preliminary survey of 1953 capital budgets conducted during October by the Securities and Exchange Commission and the Department of Commerce.

The survey indicates that if present programs materialize plant, and equipment expenditures in 1953 will total $26.3 billion compared with the record $26.9 billion in 1952.

Capital outlays totalled $26.3 billion in 1951.

Expenditures on New Plant and Equipment

Millions of Dollars

	1951	1952	1953	Percent Change 1952-53
Manufacturing	11,130	12,452	11,907	−4
Mining	911	850	871	+2
Railroad	1,474	1,398	1,120	−20
Transportation, other than rail	1,492	1,394	1,384	−1
Public utilities	3,855	3,961	4,017	+1
Commercial and other	7,470	6,804	6,972	+2
Total	26,332	26,860	26,271	−2

Public utilities are planning expenditures of about $4.0 billion in 1953, with the expansion by electric power companies almost offset by declines in the gas industry. Mining companies also expect a moderate increase in capital outlays in 1953.

Commercial and other industries, which, because of restrictions and reduced materials allocations, cut back their outlays from $7.5 billion in 1951 to $6.8 billion in 1952, are contemplating an increase to $7.0 billion in 1953.

According to present plans manufacturers' outlays for fixed capital in 1953 will amount to $11.9 billion, or 4 percent below 1952. Record expenditures are expected by petroleum companies and are estimated at $2.7 billion in 1953, compared with $2.5 billion in 1952. Iron and steel company outlays of $1.4 billion in 1953 represent a reduction from the peak 1952 expansion. Another important segment of the manufacturing industry, chemicals, is planning expansion programs of $1.4 billion in 1953, about the same as 1952.

FINANCIAL

One Puget-PUD Case Dropped

Petition to prohibit court from enforcing order blocking Kitsap participation dismissed. Date set in another action

One of the court actions filed in the legal maneuvering caused by proposed PUD purchase of Puget Sound Power & Light Co has been dismissed by agreement while trial date has been set in another action.

Judge Henry Clay Agnew of Seattle will hear arguments Feb. 5 in Kitsap County Superior Court at Port Orchard, Wash., in an action challenging the right of J. W. Bryan, Sr, to hold office as a PUD commissioner. Bryan, a leading opponent of the purchase, does not live in the district from which he was elected, the suit alleges.

Petition Dismissed . . . The State Supreme Court dismissed a petition of six PUD's and Puget Sound P&L to prohibit the Kitsap County Superior Court from enforcing a temporary restraining order which blocks the Kitsap PUD from consenting to purchase of Puget Sound P&L properties by the other five PUD's. Attorneys for both sides presented a stipulation for dismissal, without prejudice.

The dismissal was asked because the Kitsap County case has been enlarged to include all the PUD's as defendants. The Kitsap case originally was filed only against the Kitsap PUD.

Dividend Increased . . . Meanwhile, directors of Puget Sound P&L have increased the quarterly dividend 10¢ to 30¢, apparently having reached the conclusion that sale of the company's properties to the PUD's may be "materially delayed." The directors' action is subject to the approval of the Washington Public Service Commission.

President Frank McLaughlin declared three weeks ago that he would recommend an increase, in the event a delay in concluding the sale appeared likely (EW, Jan. 19, p 42). In announcing action of the directors, McLaughlin commented "it does not appear likely that a disposition of Pugets properties will be made in the near future."

He pointed out that the proposed sale to the PUD's is tied up in litigation and that the company has been informed "it is not possible for Washington Water Power to make an offer which will result in Puget stockholders immediately and unconditionally receiving $27 per share." He added that the Washington Water Power proposal "would have to be in the form of a merger, which, in the very nature of things, is time consuming."

The 30¢ dividend, described as "in line with the average for the electric industry," will be payable Feb. 16 to stock of record Jan. 30.

Industrial Rate Increase in Niagara Area Opposed

Objectors to Niagara Mohawk Power Corp's proposal to increase industrial rates by $2.1 million a year told the New York Public Service Commission recently that these increased rates would have an adverse affect on industrial growth in the Niagara Frontier.

Clarence W. Greenwald, Niagara Falls corporation counsel, stated that "Any increase in power rates to industrial consumers may seriously affect the welfare of the city, its industries, and its people."

C. H. Stevens, a consulting engineer of New York City, appeared on behalf of the electrochemical and the electrometallurgical industries in Niagara Falls. He said that in the past few years two Niagara Frontier companies built out-of-state plants where "they will pay at least $1-million per year less for 60-cycle power than if they had stayed in Niagara and this proposed rate were put into effect."

Harry C. Lautensack, vice president of General Mills and chairman of the Industrial Power Consumers Conference, and Fred C. Maloney, corporation counsel for the City of Buffalo, also protested the proposed increase in industrial rates.

Niagara Mohawk Power contends that it is seeking to:

1. Eliminate discrimination in rates to its larger power customers in the Niagara Frontier area.

2. Raise its Western Division earnings to yield a 5.81% return on the operations by reason of the rate adjustments proposed which is less than a reasonable average rate of return to which Niagara Mohawk is entitled and is required to render satisfactory service in this division.

A PSC decision is expected soon.

FINANCIAL BRIEFS

Blyth & Co has sold quickly a secondary offering of 18,000 common shares of Wisconsin Public Service Corp at $19.75 a share . . . **Connecticut Light & Power Co** has sold privately $35 million of first and refunding mortgage 3¼s, due 1982 through Putnam & Co, Chas. W. Scranton & Co and Estabrook & Co. Company has delivered $31,350,000 and balance will be delivered in July . . . **Arkansas Power & Light Co** will spend nearly $40 milllion for construction in 1953 . . . **Sho-Me Power Corp** has asked Missouri Public Service Commission approval to sell its distribution lines in and around Mountain View, Brick Tree, and Winona at a base price of $139,952 to Howell-Oregon Electric Cooperative, Inc, West Plains, Mo.

Consumers Power Co announced that Morgan & Stanley & Co made the winning bid of $120,850, or 19.565¢ a share for underwriting compensation for the purchase at the subscription price of $35 a share of any unsubscribed shares of the 617,669 additional shares being offered to commonholders on 1-for-10 basis. Company will spend more than $58 million in 1953 for construction.

Eastern New York Power Co, a part of the International Hydro-Electric System which Securities and Exchange Commission has ordered to dissolve, has asked New York Public Service Commission approval to sell its properties for $13.6 million. Niagara Mohawk Power Corp will pay $8 million for part of the properties and New York State Electric & Gas Corp will pay $5.6 million.

Federal Power Commission will hold an oral argument on March 11 in Washington, D. C., to consider rules relating to treatment for accounting

and rate making purposes under the Federal Power and Natural Gas Acts of tax savings resulting from the allowance of accelerated amortization in income tax computation. Interested persons have until Feb. 27 to submit written views and comments. Those who intend to participate in the meeting are to advise the secretary of FPC by March 6.

REGULATION

Ohio Public Utilities Commission has announced that from now on there will be no more informal talks on any matter, after it had been assigned a formal docket number, unless both parties and all intervenors in the matter has been notified of the conference. PUC spokesman has pointed out that new policy would in no way affect informal complaints and discussions. He said PUC's offices still would be open to the public.

Consolidated Gas Electric Light & Power Co has asked dismissal of Pennsylvania Water & Power Co's suit for $2,171,483 in damages. Con Gas has also asked similar damages in a counter-claim against the Pennsylvania W&P. In its suit, Con Gas has alleged it is due the damages because of overcharges by Pennsylvania W&P since the Federal Power Commission required Pennsylvania W&P to reduce its charges. Pennsylvania W&P has claimed damages to cover "reasonable operating expenses."

Toronto Hydro Commission will begin with the February billings increasing rates to 155,000 domestic consumers by 14.48%, to commercial consumers by 15.49% and also will charge higher rates to industrial or power AC users . . . **Mountain States Power Co** will reduce rates after Feb. 1 approximately $72,000 annually to customers in Sandpoint, Priest River, Clark Fork, and other adjacent areas served by the company . . . **Metropolitan Edison Co** has asked Pennsylvania Public Utilities Commission approval to withdraw a plan to increase industrial rates. Commission said that they were withdrawn after PUC raised questions on a "rate block" setup and on a fuel adjustment formula.

For a well-prepared booklet "So You Need a Raise, Too? . . . Here's Why," write J. A. McAfee, president, Union Electric Co of Missouri, St. Louis.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1953									
Jan. 15	**3.04**	**3.08**	**3.17**	**4.09**	**4.27**	**4.59**	**5.02**	**5.39**	**5.65**
Jan. 8	3.01	3.05	3.15	4.06	4.24	4.59	4.99	5.37	5.63
END OF QTR:									
4th 1952	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
California Oregon Power	12	Nov.	$2,601,682	$2,378,634	$1.68	....
Pacific Power & Light	12	Nov.	4,338,871	3,523,209	....	....
Southwestern Public Service (a)	12	Aug.	5,489,831	4,655,293	1.44	$1.31

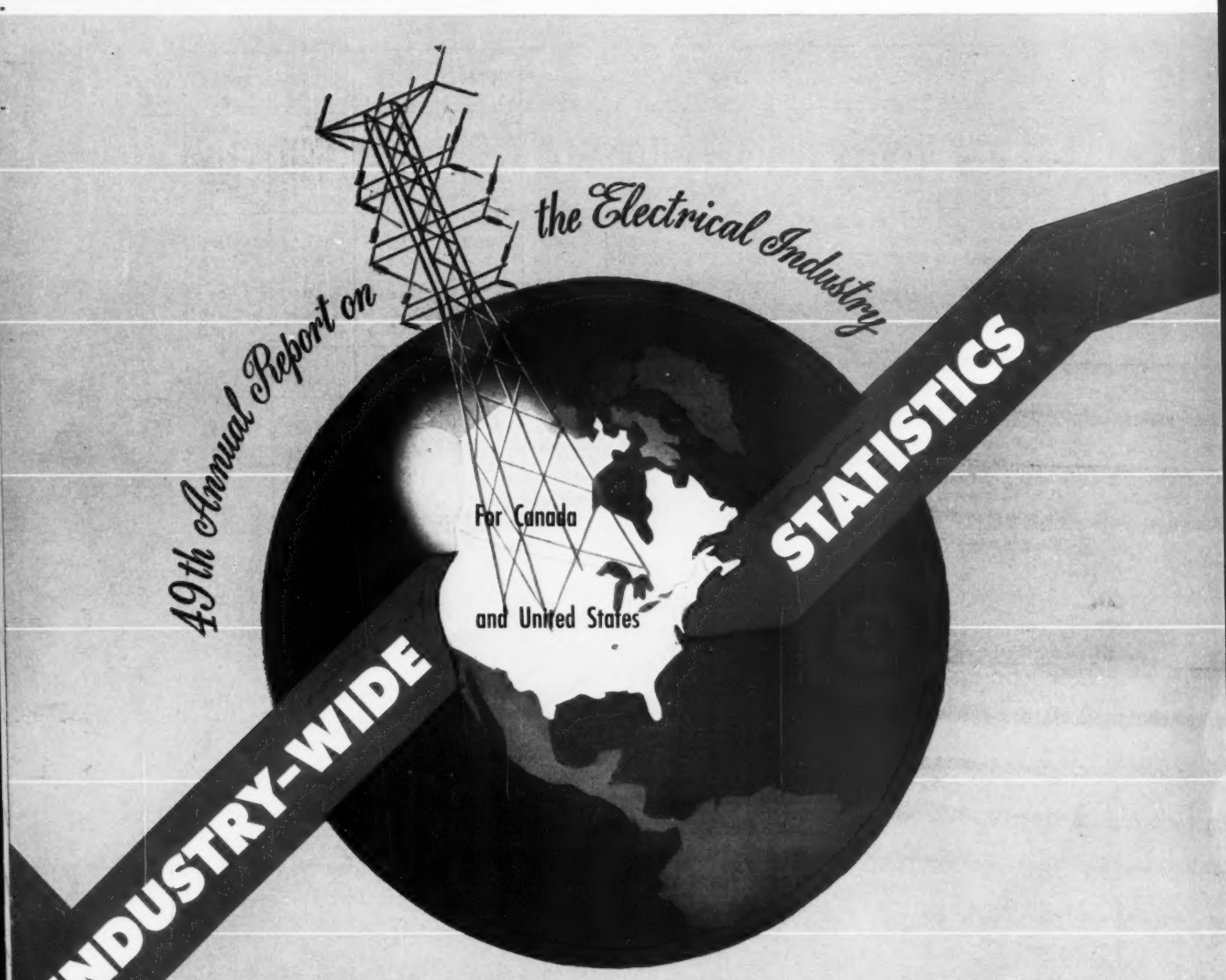
Notes—(a) Figures have been audited.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF JANUARY 15–21			
Bonds			
Kansas City Power & Light — 1st mtg 3.14% due 1983	$12,000	$101.347	3.18%
Ohio Power — 1st mtg 3⅛% due 1983	22,000	102.625	3.24%
Preferred Stock			
Ohio Power — 100,000 sh $100 par 4.40%	$10,000	$103.00	4.27%
Common Stock			
West Penn Electric—264,000 sh (being offered commonholders on 1-for-15 basis, record Jan. 22 to expire Feb. 9)	$8,976	$34.00	6.47%
SCHEDULE FOR JANUARY—FEBRUARY			
Bonds			**Bid Date**
Yazoo, Miss., electric revenues, 1953–1977	$1,750	.....	Jan. 26
Iowa-Illinois Gas & Electric—1st mtg	8,000	.....	Jan. 27
Jacksonville, Fla., electric system	18,000	.....	Feb. 3
Southwestern Public Service—1st mtg	12,000	.....	Feb. 4
Iowa Southern Utilities—1st mtg	7,000	.....	Feb. 17
Consolidated Edison Co of New York—1st mtg	40,000	.....	Feb. 17
Niagara Mohawk Power—1st mtg	25,000	.....	Feb. 18
Florida Power & Light—1st mtg	15,000	.....	April 7
Debentures			
Province of Ontario, due 1975	$50,000	.....	Jan. 28 (d)
Preferred Stock			
Iowa-Illinois Gas & Electric—60,000 sh $100 par	$6,000	.....	Jan. 27
Northern Indiana Public Service—80,000 sh $100 par	8,000	.....	Jan. 28 (a)
Southwestern Public Service—20,000 sh $100 par	2,000	.....	Feb. 4
Illinois Power—150,000 sh $50 par	7,500	.....	..... (b)
Common Stock			
Southwestern Public Service—293,462 sh (to be offered to commonholders on 1-for-12 basis, record Feb. 2 to expire Feb. 17; stockholders will be allowed oversubscription privileges)	.....	.....	.....
Louisville Gas & Electric—200,000 sh (to be offered commonholders on 1-for-7 basis, record Jan. 29 to expire Feb. 17)	.....	.....	..... (e)
Niagara Mohawk Power—1,000,000 sh	.....	.....	Feb. 16
Illinois Power—250,000 sh	.....	.....	..... (c)
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Central Maine Power—1st general mtg	$10,000	.....	.....
Rockland Light & Power—1st mtg	5,500	.....	.....
Wisconsin Public Service—1st mtg	7,500*	.....	.....
Monongahela Power—1st mtg	10,000	.....	.....
Arkansas Power & Light—1st mtg	18,000	.....	.....
Dallas Power & Light—1st mtg	9,000	.....	.....
Jersey Central Power & Light—1st mtg	9,000	.....	.....
Louisiana Power & Light—1st mtg	10,000	.....	.....
Metropolitan Edison—1st mtg	9,500	.....	.....
Mississippi Power & Light—1st mtg	12,000	.....	.....
Preferred Stock			
Rockland Light & Power	$5,500	.....	.....
Wisconsin Public Service	2,500*	.....	.....
Texas Electric Service	8,000	.....	.....
Common Stock			
Gulf States Utilities	$6,000	.....	.....

Notes— * Estimated. (a) Central Republic Co-Blyth & Co-Merrill Lynch group, underwriters; (b) Merrill Lynch-First Boston Corp group, underwriters; (c) First Boston Corp-Merrill Lynch group, underwriters; (d) Harriman Ripley & Co-Wood Gundy & Co group, underwriters. Proceeds of the issue to be advanced to Hydro-Electric Power Commission of Ontario; and (e) Lehman Bros-Blyth & Co group, underwriters.

Electrical World



HIGHLIGHTS

Budget: $4,182,531,000
Bulk of 1953 budget will go into new generating capacity, 51% of the total

Capacity: 81,975,000 kw
For next three years planned new capacity totals 32,046,871 kw, 87% of this will be thermal

Generation: 399,374,000,000 kwhr
Up 7.7% over last year. Pounds of coal per kwhr drops to 1.10. Use of gas increased 18.5%

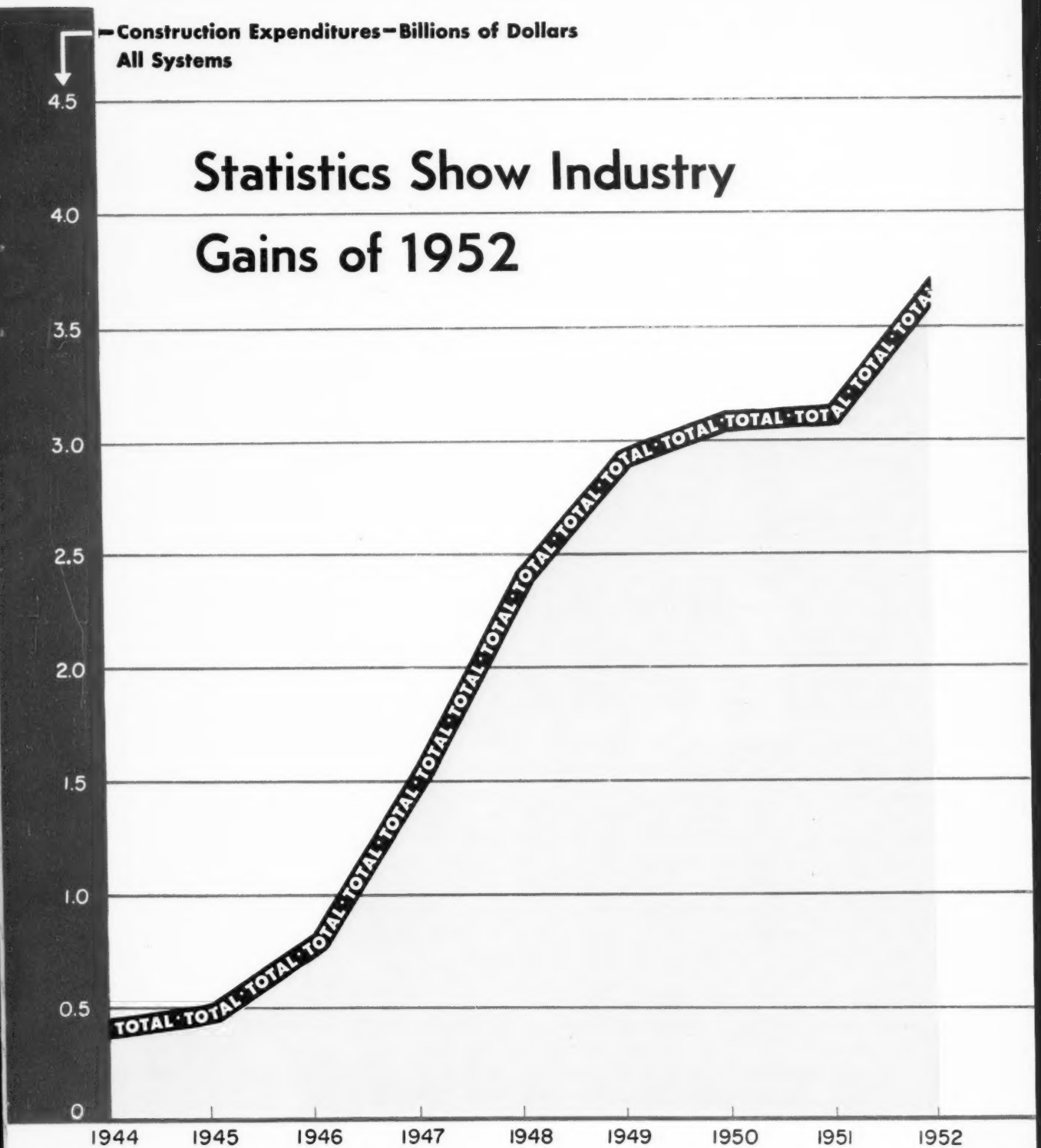
Manufacturing:
Shipments of generation, transmission, and distribution equipment rose sharply

The Statistics Summarized

	1946	1947	1948	1948	1950	1951	1952*	% Change 1951–1952
FINANCIAL[1]								
Fixed Capital ($1,000,000)	13,351	14,065	15,720	17,380	19,150	20,756	22,750	9.6
Securities issued ($1,000,000)	1,082	1,577	1,451	1,793	1,708	1,442	1,706	18.3
New capital	173	567	1,315	1,445	1,300	1,432	1,694	18.3
Refunding	909	1,010	136	348	408	10	12	20.0
INCOME and OUTGO[1] **($1,000,000)**								
Operating revenue	3,127	3,480	3,886	4,113	4,510	5,004	5,400	7.9
Operating expenses	1,385	1,701	2,019	2,030	2,158	2,397	2,550	6.4
Taxes	639	664	712	794	948	1,150	1,240	7.8
Net Income	651	656	666	765	831	822	934	13.6
Dividends	466	500	499	655	626	658	718	9.1
Balance to Surplus	185	156	167	110	205	164	216	31.7
EXPENDITURES ($1,000,000)								
Construction	823	1,569	2,418	2,954	3,118	3,151	3,740	18.7
REVENUE ($1,000,000)								
Total	3,460	3,853	4,313	4,614	5,086	5,648	6,126	8.5
Rural[3]	105	124	141	161	158	175	184	5.1
Residential	1,241	1,366	1,533	1,716	1,932	2,165	2,398	10.8
Small Light and Power	925	1,031	1,153	1,229	1,334	1,462	1,582	8.2
Large Light and Power	969	1,107	1,251	1,263	1,405	1,572	1,679	6.8
Other	220	225	237	245	258	273	284	4.0
ENERGY SALES (1,000,000 kwhr)								
Total	190,795	217,581	240,740	248,542	280,539	318,168	343,068	7.8
Rural[3]	4,431	5,551	6,327	7,384	7,400	8,479	8,519	0.5
Residential	38,571	44,171	50,978	58,139	67,030	77,024	87,030	13.0
Small Light and Power	33,016	38,379	43,193	46,262	50,446	57,278	62,150	8.5
Large Light and Power	98,885	113,523	124,088	120,766	139,065	157,827	167,450	6.1
Other	15,891	15,957	16,154	15,991	16,599	17,032	17,920	5.2
PRODUCTION (1,000,000 kwhr)								
Total	223,178	255,739	282,698	291,099	329,141	370,673	399,374	7.7
Fuel	144,772	177,314	200,228	201,351	233,203	270,922	293,094	8.2
Hydro	78,406	78,425	82,470	89,748	95,938	99,751	106,280	6.5
CAPACITY (1,000 kw)[2]								
Total	50,317	52,322	56,560	63,100	68,919	74,678	79,778	6.8
Fuel	35,468	37,351	40,908	46,446	51,244	55,939	59,900	7.1
Hydro	14,849	14,971	15,652	16,654	17,675	18,739	19,878	6.1
FUEL CONSUMPTION[5]								
Coal (1,000 tons)	72,200	89,530	99,950	83,960	91,870	104,520	105,770	1.2
Oil (1,000 bbl)	36,316	45,308	42,644	66,306	75,420	63,830	63,140	−1.1
Gas (billion cu ft)	307	373	478	550	628	749	887	18.4
Pounds of coal per kwhr	1.29	1.31	1.30	1.24	1.19	1.17	1.10	−6.0
CUSTOMERS (1,000)[2]								
Total number	36,140	38,432	40,722	42,851	44,986	46,589	48,239	3.5
Rural[3]	1,381	1,522	1,695	1,804	1,596	1,657	1,699	2.5
Residential	29,769	31,622	33,549	35,375	37,533	39,993	40,489	1.2
Small Light and Power	4,693	4,961	5,132	5,291	5,466	5,529	5,634	1.9
Large Light and Power	175	191	204	232	235	248	259	4.4
Other	122	136	142	148	158	162	158	−2.5
People in homes served (1,000)	115,000	123,000	130,000	134,000	141,500	147,000	151,000	2.7
Percent of total civil population	82	86	89	90	94	95	97	2.0
EMPLOYEES[4]	.....	213,000	226,400	233,500	234,000	234,300	237,600	1.4

* Estimated, generally on ten months' operation. [1] Power companies. [2] For 1951 and 1952 data is final and is that reported on November 1. [3] On specific rural rates only. [4] Covers employees in the electrical departments of power companies only; new series begun in 1947. [5] For 1951 and 1952 data is final and is that of 12 months ended October 31.

Statistics Show Industry Gains of 1952



Construction totalling $3.7 billion was completed by the nation's electric utilities during 1952. Power companies were responsible for $2.6 billion or 70% of this amount. Second largest expenditure for new construction was made by the federal government—nearly $700 million dollars, 18% of the total.

Plans call for increasing construction by nearly $450 million during 1953. This 12% increase will bring expenditures to a record $4.2 billion.

That the shortage of critical materials has seriously held back the utilities construction program is clearly indicated by the additions reported to Electrical World—only 6,948 Mw. A year ago utilities reporting their plans for 1952 to Electrical World, indicated that they were planning to add 9,069 Mw.

Plans for 1953 include the addition of 11,763 Mw while additions planned for the next three years total nearly 33,000 Mw.

Total capacity at nameplate was 82.0 million kw at the end of 1952. Of this total 20.2 million kw was hydro, 61.8 million kw thermal.

Customer Growth Leveling Off . . . Utilities added over 1.5 million new customers in 1952, bringing the total to about 48.5 million. This leveling off from the phenomenal two-million-a-year customer growth experienced since World War II was chiefly due to the fact that 97% of all the nation's homes have now been electrified. As a result future customer additions will largely reflect the formation of new households.

Use of electricity in the American home continued to increase during 1952. Use by the average residential customer rose 171 kwhr during the year to reach a record 2,175 kwhr.

This increase together with the increase in the number of customers raised sales to residential customers 13.0% to 87 billion kwhr.

Industrial Sales Rise Despite Steel Strike . . . Despite the steel strike sales of energy to industrial customers rose 6.1%, and sales to commercial customers 8.5%. These increases together with the increase in sales to other classes raised total sales 7.8% to 343 billion kwhr.

To meet this increased demand for electricity production rose 7.7% to 399 billion kwhr.

Of the total 293 billion kwhr, 73% was produced by thermal capacity 106 billion kwhr, 27% by hydro.

As a result of increased sales and rate increases, revenues rose 8.5%, to a record $6.1 billion. Largest increase in revenue was made from sales to residential customers, 10.8% to $2.4 billion. This is almost 40% of the total revenue.

Helping to lessen the heavy impact of increasing costs is the reduction in coal required to produce a kwhr of electricity. Coal rate is now 1.1 lb per kwhr, 3.9% lower than in 1951.

The use of gas increased 18.5% during the year ended October 31, 1952. A record 887 billion cu ft was consumed during this period. At the same time the use of oil fell 1% and that of coal increased only 1%. As a result energy generated from coal, oil and gas increased 7.8%.

More on the Payroll . . . Employment in the electric companies showed a slight gain of rising 237,600 to non-supervisory employees and working supervisors. Weekly earnings rose $2.44 to an average of $75.18. Average hours worked per week decreased from 41.9 to 41.3 during 1952.

Maintenance, as a percentage of electric plant in service reached a record post war low of 1.89% during 1951, the latest figure available. This compares with 2.01% in 1947. When adjustments are made for the change in price levels, we find that the cost of maintenance as a percentage of plant in service has dropped 22.7% since 1947.

Operating revenues of electric companies hit a new high in 1952—totalling $5.4 billion. This boosted net income to $934 million, a record high.

Security sales were increased to $1,706 million, second only to the $1,708 million total of 1950. This provided much of the money needed for the expansion program now under way.

It was this huge expansion which was responsible for the sharp increase in shipments of generation, transmission and distribution equipment, and insulated wire and cable. Details of the trend in electrical manufacturing shows this. Shipments of other electrical products declined or showed only moderate advances. As a result total shipments remained virtually unchanged.

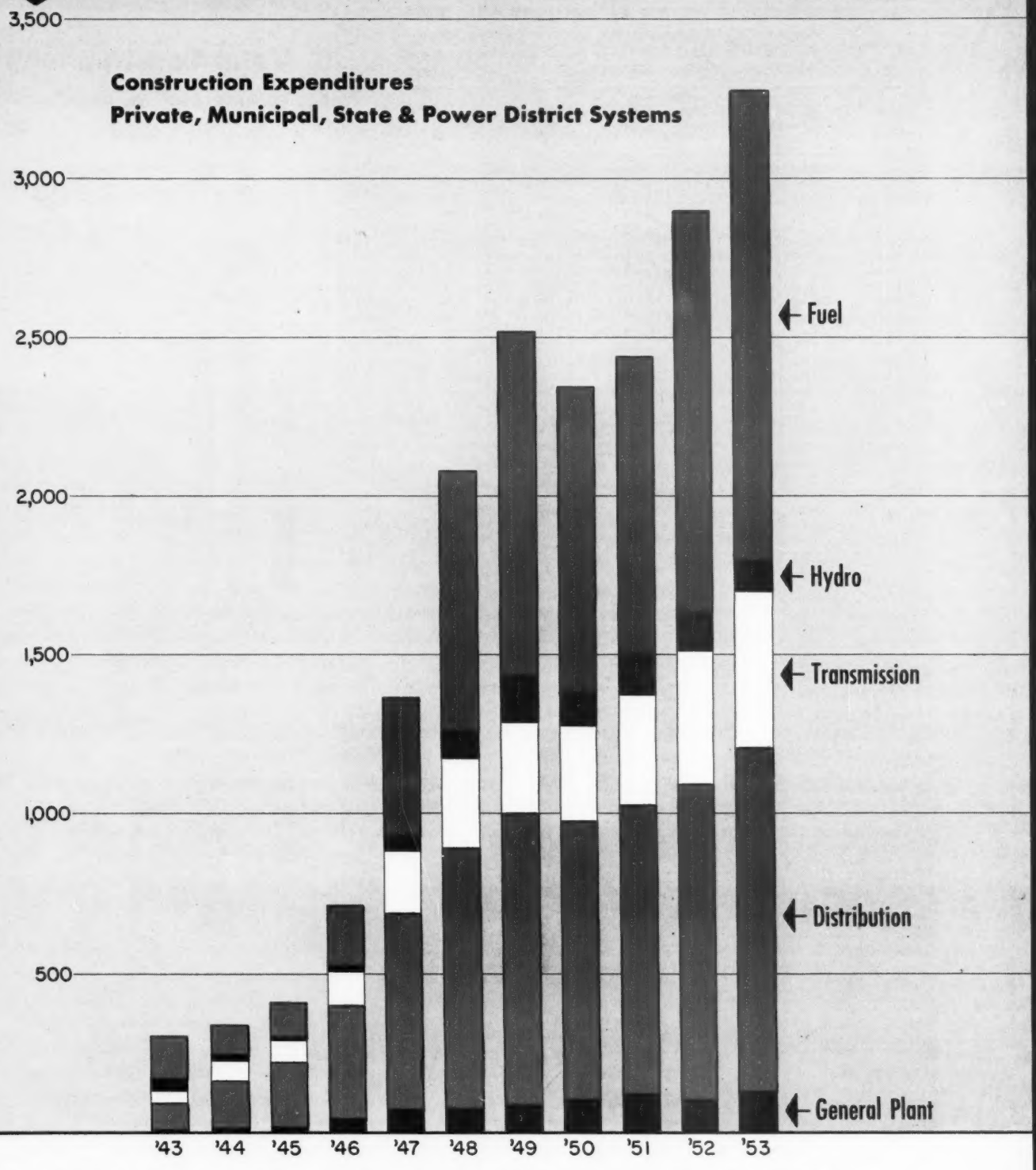
Use of Energy by Industries Studied . . . The results of a special study presented for the first time indicate that American manufacturers use more than 177.5 billion kwhr annually. Of this amount they purchased fully three quarters at a cost of $1.3 billion.

Manufacturers of the primary metals group, including aluminum, steel, and copper producers, use 14% of the energy consumed by industry.

This year special studies were made on the electric utility construction in the U. S. Possessions and Canada. Details reveal that construction by Canadian electric utiltities totalled $569 million in 1952. Estimates for 1953 indicate expenditures will reach $538 million.

Annual production of energy by Canadian utilities rose above 60 billion kwhr for the first time during 1952 exceeding 61 billion kwhr. Exports to the United States may have topped the record of 2.6 billion set in 1945.

Reports received from electric utilities operating in Hawaii, Alaska, and Puerto Rico indicate total construction of $38 million during 1953.



'53 Construction Will Top $4 Billion

Construction by electric utilities totaling $3.7 billion during 1952, will reach $4.2 billion in 1953.

This estimate is the result of Electrical World's nation-wide and industry-wide survey. Reports were from electric utilities operating 92% of the nation's capacity serving 83% of its electric customers. Nationwide totals include data on all groups.

Annual Capital Expenditures for New Construction
Private, Municipal, State & Power District Systems
Thousands of Dollars

	Fuel	Hydro	Trans-mission	Distri-bution	General Plant	Total
1937	113,060	10,540	65,385	227,895	38,600	455,480
1938	133,000	17,600	59,200	238,200	34,000	482,000
1939	101,500	17,900	61,375	226,375	22,850	430,000
1940	200,430	9,270	84,780	266,580	35,520	596,580
1941	219,741	27,186	101,085	272,449	32,687	654,148
1942†	191,671	22,847	85,633	144,180	11,644	455,975
1943	137,059	35,505	42,923	84,683	6,066	306,236
1944	96,126	19,888	61,196	151,969	11,105	340,284
1945	106,166	12,713	68,935	204,492	16,623	408,929
1946	190,955	18,974	106,550	360,980	40,710	718,169
1947	440,547	40,901	195,074	624,038	71,585	1,372,145
1948	813,025	86,188	280,530	822,275	76,070	2,078,088
1949	1,078,081	150,653	288,358	916,475	84,047	2,517,614
1950	960,739	107,730	300,093	879,242	99,367	2,347,171
1951	940,547	125,463	346,059	910,581	120,674	2,443,324
1952	1,260,418	128,711	417,427	988,861	105,833	2,901,250
1953‡	1,478,676	98,055	492,511	1,082,103	129,378	3,280,723

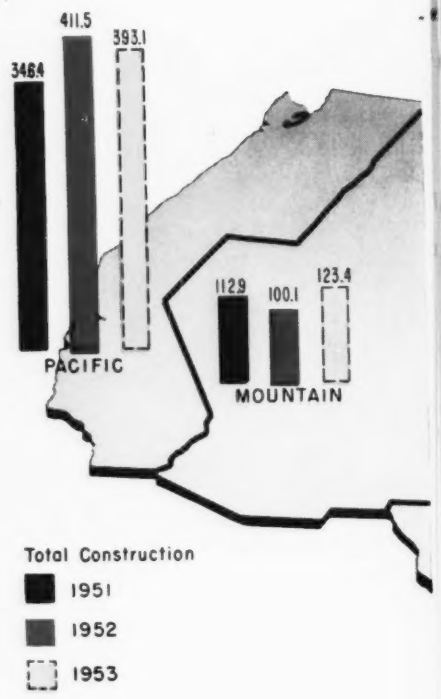
	Fuel	Hydro	Trans-mission	Distri-bution	General Plant	Total
1952						
New England	54,324	2,215	12,510	55,156	6,038	130,243
Middle Atlantic	259,235	8,987	58,742	184,635	20,439	532,038
East North Central	351,999	532	112,752	194,881	27,119	687,283
West North Central	116,923	3,383	47,629	68,518	9,174	245,627
South Atlantic	184,336	9,251	56,050	139,494	12,634	401,765
East South Central	34,773	2,059	20,709	49,163	5,585	112,289
West South Central	118,918	0	49,069	103,328	9,107	280,422
Mountain	42,634	5,887	9,621	37,518	4,423	100,083
Pacific	97,276	96,397	50,345	156,168	11,314	411,500
United States	**1,260,418**	**128,711**	**417,427**	**988,861**	**105,833**	**2,901,250**
1953‡						
New England	70,213	7,190	12,940	69,796	8,203	168,342
Middle Atlantic	307,139	9,535	74,407	207,764	28,140	626,985
East North Central	454,360	6,355	145,972	213,252	28,842	848,781
West North Central	94,506	3,721	53,302	74,545	10,648	236,722
South Atlantic	176,834	6,197	69,540	149,927	13,059	415,557
East South Central	63,432	314	21,572	48,770	4,584	138,672
West South Central	151,019	0	54,495	111,848	11,814	329,176
Mountain	48,757	12,422	15,695	40,194	6,319	123,387
Pacific	112,416	52,321	44,588	166,007	17,769	393,101
United States	**1,478,676**	**98,055**	**492,511**	**1,082,103**	**129,378**	**3,280,723**

Source: "Electrical World" surveys. † Expenditure study not made by "Electrical World" in 1942. Figures are those reported by Federal Power Commission for privately owned utilities only. ‡ Prospective

Coverage of Electrical World's 1952–1953 Survey

	Percentage of Group Reporting on the basis of		Percentage of U. S. Total	
	Capacity	Customers	Capacity	Customers
Power Companies	95.7%	93.2%	78.6%	79.8%
Municipal, State & Power District Systems	52.2%	47.0%	8.9%	12.6%
Cooperatives	38.9%	24.3%	1.0%	7.6%
Federal Agencies	100.0%	not applicable	11.5%	not applicable
All Groups	**91.8%**	**82.8%**	**100.0%**	**100.0%**

Total Construction

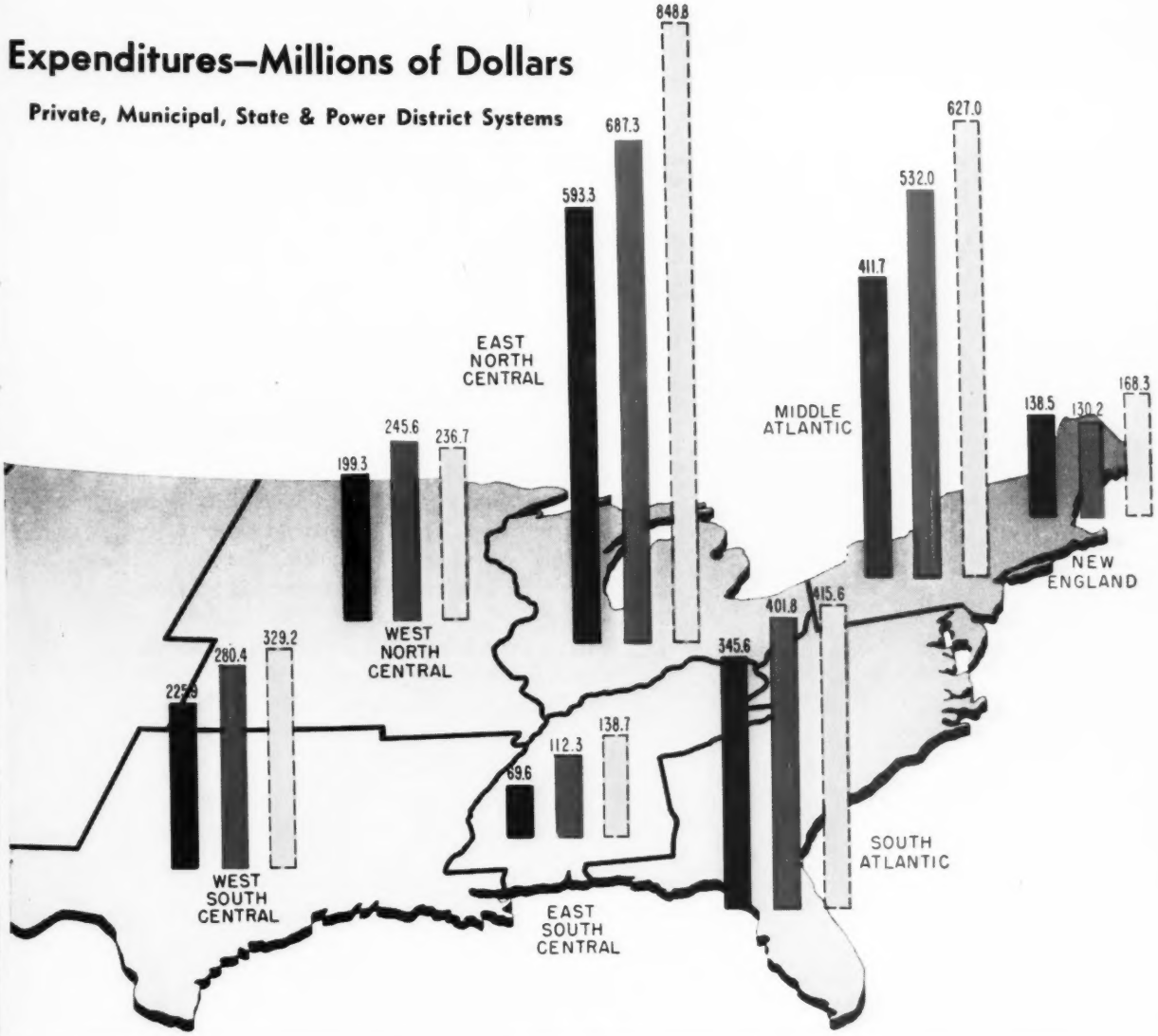


Among the federal agencies included in this survey are the Department of Interior's Bureau of Reclamation (including the Alaskan District), the Bonneville Power Administration, the Bureau of Indian Affairs and the Southwestern Power Administration. Reports from the Tennessee Valley Authority and the Corps of Engineers complete the picture.

Largest share of 1953's budget is for the construction of new thermal capacity. Utilities will spend $1.7 billion, 40.9% of the total for thermal plants after spending $1.5 billion in 1952.

Expenditures—Millions of Dollars

Private, Municipal, State & Power District Systems



Construction Expenditures—All Systems

Thousands of Dollars

	Fuel	Hydro	Transmission	Distribution	General Plant	Total
1952 (Estimated)						
Power Companies	1,152,222	98,378	379,459	878,750	90,084	2,598,893
Municipal, State & Power District Systems	108,196	30,333	37,968	110,111	15,749	302,357
Cooperatives	13,000†	.....	20,500	128,780	8,400	170,680
Federal Agencies	181,800	341,314	139,408	90	5,010	667,622
Total	**1,455,218**	**470,025**	**577,335**	**1,117,731**	**119,243**	**3,739,552**
1953 (Prospective)						
Power Companies	1,358,171	74,011	455,529	945,346	108,788	2,941,845
Municipal, State & Power District Systems	120,505	24,044	36,982	136,757	20,590	338,878
Cooperatives	18,000†	.....	17,900	115,254	11,800	162,954
Federal Agencies	213,000	366,204	155,193	310	4,147	738,854
Total	**1,709,676**	**464,259**	**665,604**	**1,197,667**	**145,325**	**4,182,531**

Source: "Electrical World" Survey. † Includes expenditures for both fuel and hydro.

Possessions to Spend $38 Million for New Construction in '53

Construction Expenditures
Thousands of Dollars

	Generation	Transmission	Distribution	General Plant	Total
1952					
Hawaii	706	475	1,888	119	3,188
Alaska & Puerto Rico	17,805	1,982	4,415	1,155	25,357
Total	18,511	2,457	6,303	1,274	28,545
1953 (Prospective)					
Hawaii	5,308	1,320	2,068	82	8,778
Alaska & Puerto Rico	17,445	2,671	5,854	2,998	28,968
Total	22,753	3,991	7,922	3,080	37,746

Source: "Electrical World" Survey.

Construction by electric utilities operating in Hawaii, Alaska, and Puerto Rico totaled $28 million in 1952. Estimates for 1953 indicate a total spending of $38 million.

Reports were received from utilities operating 94% of Alaska's and Puerto Rico's capacity and serving 89% of their customers.

Reports were received from nearly all Hawaiian utilities.

Data for Alaska and Puerto Rico have been combined to avoid the disclosure of construction expenditures by an individual utility. Data are for all agencies both public and private.

Rural Line Construction & Maintenance
Thousands of Dollars

	Rural Line Construction		Maintenance	
	1952	1953	1952	1953
Hawaii	80	325	1,531	1,520
Alaska & Puerto Rico	926	1,329	1,578	1,832
Total	1,006	1,654	3,109	3,352

Source: "Electrical World" Survey.

Capacity Additions Reported to Electrical World—Kw

	1952	1953	1954	1955	After 1955
Hawaii					
Maui Electric Co. Ltd.	.....	11,500S	.....	.....	.....
Hawaiian Electric Co. Ltd.	.....	.....	.....	40,000S	40,000S
Hilo Electric Light Co. Ltd.	9,225S 3,350H 5,050IC	.....	.....	2,000IC	11,000S
Alaska					
Ketchikan Public Utilities	.....	.....	4,000H	.....	.....
Anchorage Public Utilities	2,000IC	.....	7,500S	.....	.....
U. S. Department of Interior	.....	.....	30,000H	.....	.....
Puerto Rico					
Puerto Rico Water Resources Authority	20,000S 4,000H	8,000H	.....	20,000H	40,000S
Isabela Irrigation Service	.....	.....	500H	.....	.....

Primary Distribution Line Construction†

	Total			Rural		
	1951	1952	1953	1951	1952	1953
Hawaii	51	33	50	18	3	15
Alaska & Puerto Rico	203	221	207	174	143	147
Total	254	254	257	192	146	162

Source: "Electrical World" Survey. † Pole miles 25 kv and below.

Substation Construction

	1952		1953	
	Kva	Dollars	Kva	Dollars
Hawaii	10,359	357,000	16,038	532,000
Alaska & Puerto Rico	32,981	436,000	21,691	1,838,000
Total	43,340	793,000	37,729	2,370,000

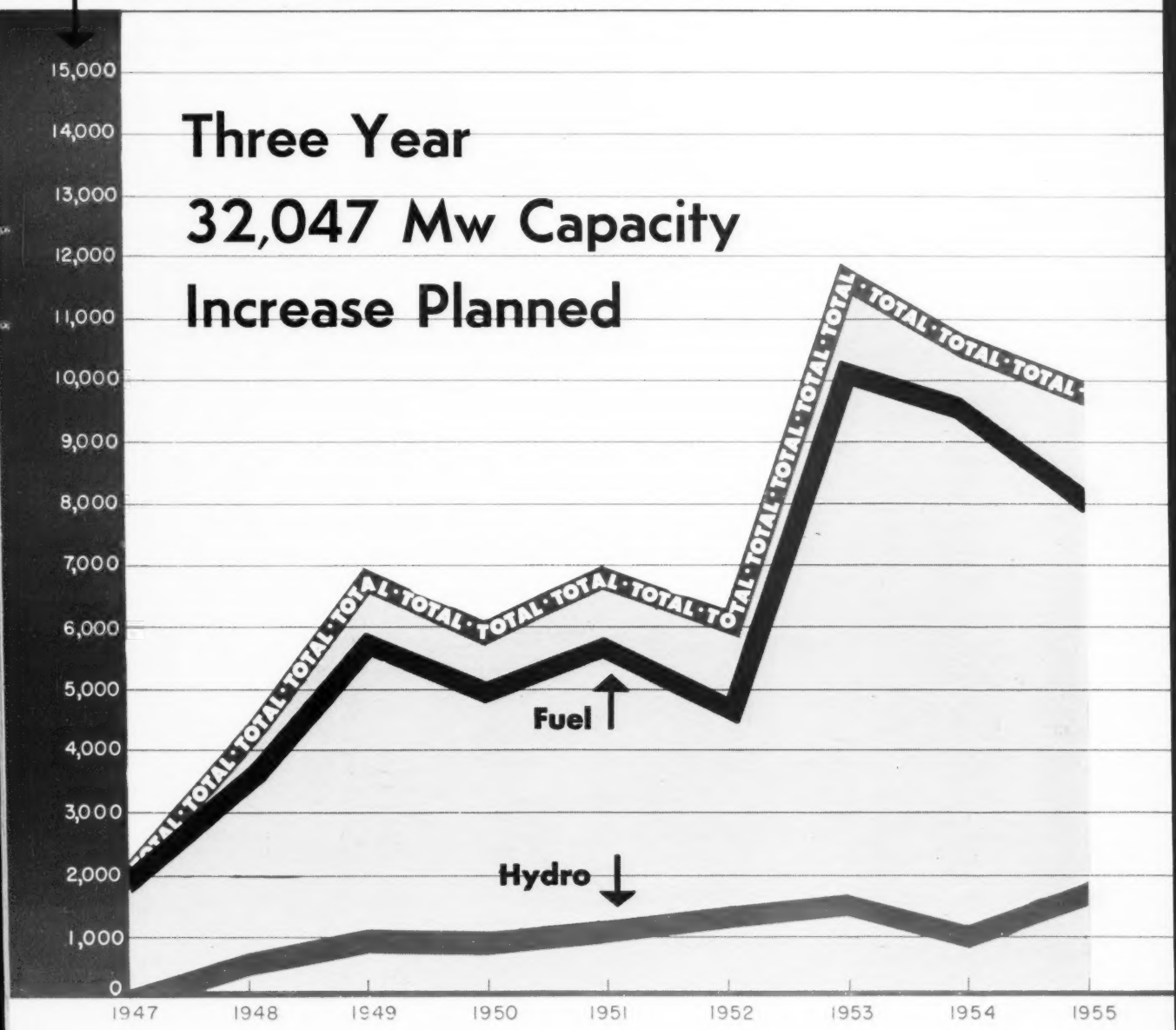
Source: "Electrical World" Survey.

Circuit Miles of Transmission Line Construction

	22–65 kv			66 kv and up		
	1951	1952	1953	1951	1952	1953
Hawaii	18	13	51	....	....	....
Alaska & Puerto Rico	93	66	18	13	41	11
Total	111	79	69	13	41	11

Source: "Electrical World" Survey.

NEW CAPACITY



The nation's electric utilities plan to add 32,047 Mw during the next three years—an increase of about 40%.

Increases during 1952 reported by utilities in Electrical World's recently completed survey total 6,948 Mw. This is 2,121 Mw or 23% below the 9,069 Mw planned 1952 addition which these utilities reported in last year's survey. This slippage is due to the shortage of critical material which is holding back the utilities construction program.

Fully 85%, 28,079 Mw, of the additions reportedly planned during the next three years will be steam. New hydro capacity will account for 15%, 4,214 Mw.

Of the total planned through 1955, 22,941 Mw or 70% has been scheduled by the nation's power companies.

Gross Capacity Additions
Megawatts

	Fuel	Hydro	Total
1947.....	2,065	138	2,203
1948.....	3,697	726	4,423
1949.....	5,825	1,101	6,926
1950.....	5,032	1,052	6,048
1951.....	5,972	1,215	7,186
1952.....	4,848	2,100	6,948
1953*.....	10,106	1,657	11,763
1954*.....	9,621	1,249	10,870
1955*.....	8,105	1,308	9,413
After 1955*.	4,696	14,218	18,914

Source: "Electrical World" Surveys. Federal Power Commission.
*Prospective.

Capacity Additions Reported to

Summary

	1952	1953	1954	1955	After 1955
STEAM					
Power Companies	3,934,470	8,666,070	7,284,570	6,194,850	4,082,000
All Other *	865,800	1,387,000	2,307,750	1,879,500	583,000
Total Steam	4,800,270	10,053,070	9,592,320	8,074,350	4,665,000
HYDRO					
Power Companies	481,975	264,200	170,600	296,000	1,233,900
All Other *	1,617,700	1,393,184	1,078,067	1,012,100	12,984,100
Total Hydro	2,099,675	1,657,384	1,248,667	1,308,100	14,218,000
INTERNAL COMBUSTION†					
Power Companies	37,141	30,840	15,440	17,500	9,940
All Other *	11,330	21,700	14,000	13,500	21,500
Total Internal Combustion	48,471	52,540	29,440	31,000	31,440
TOTAL					
Power Companies	4,453,586	8,961,110	7,470,610	6,508,350	5,325,840
All Other *	2,494,830	2,801,884	3,399,817	2,905,100	13,588,600
Total	6,948,416	11,762,994	10,870,427	9,413,450	18,914,440

Source: "Electrical World" Survey. * Includes Municipal, State, Power District, Cooperative, and Federal systems. † Includes gas turbine capacity additions.

Steam Additions—Power Companies

	Added in 1952	1953	1954	1955	After 1955
Alabama Pr Co	100,000	125,000	125,000	156,250	
Appalachian Elec Pr Co		351,500			
Arizona P S & Northern Arizona Lt & Pr			100,000	100,000	
Arkansas Pr & Lt Co		224,000	125,000		
Atlantic City Elec Co	10,000	4,000	75,000		
Bangor Hydro-Elec Co			11,500		
Boston Edison Co	81,250		81,250		
California Elec Pr Co	60,000	40,000		40,000	
Carolina Pr & Lt Co	125,000		99,000	99,000	
Central Illinois El & Gas	30,000			30,000	
Central Illinois Lt Co	60,000				
Central Illinois P S Co	60,000		60,000		
Central Louisiana Elec	20,000	20,000			
Central Hudson Gas & El Corp			60,000		
Central Pr & Lt Co	33,000		66,000	99,000	66,000
Cheyenne Lt Fuel & Pr					10,000
Cincinnati Gas & Elec	100,000	100,000	125,000		
Cleveland Elec Ill		200,000	100,000	166,600	
Cliffs Pr & Lt Co			11,500		
Columbus & S. Ohio	60,000	60,000		90,000	
Commonwealth Edison	110,000	210,000	450,000	180,000	
Connecticut Lt & Pr Co			75,000		100,000
Consol. Edison Co	15,000	260,000	71,000		160,000
Consol. Gas Elec Lt & Pr of Balt	100,000	75,000		125,000	
Consumers Pr Co	170,000	106,000		135,000	135,000
Dallas Pr & Lt Co		65,000	60,000	100,000	150,000
Dayton Pr & Lt Co	60,000	60,000			
Delaware Pr & Lt Co			75,000		
Detroit Edison Co		250,000	250,000		
Duke Pr Co	200,000	250,000	266,000	150,000	
Duquesne Lt Co	80,000	80,000	100,000	125,000	
Eastern Shore P S Co of Md					60,000
Electric Energy Inc		625,000		312,000	
El Paso Elec Co			30,000		
Empire District Elec Co		40,000			
Florida Pr Corp	40,000	110,000	30,000	60,000	100,000
Florida Pr & Lt Co	56,470	56,470	56,470		
Georgia Pr Co	140,000	100,000	200,000		40,000
Gulf Pr Co	30,000	80,000			
Gulf States Utilities Co	60,000	100,000	40,000	100,000	
Hartford Elec Lt Co			60,000		90,000
Houston Ltg & Pr Co		300,000	100,000	125,000	156,000
Illinois Pr Co		175,000	175,000		100,000
Indiana & Kentucky El				800,000	400,000
Indiana & Michigan El	125,000		175,750		
Indianapolis Pr & Lt Co	60,000	60,000			
Interstate Pr & Subs	25,000			30,000	
Iowa Elec Lt & Pr Co		15,000	30,000	30,000	
Iowa-Illinois G & E Co		23,000	16,600		
Iowa Pr & Lt Co		110,000	66,000		
Iowa P S Co	5,000	16,500		20,000	40,000
Iowa Southern Utilities		44,000			
Jersey Central P & L Co		62,500		125,000	
Kansas City P & L Co		99,000		99,000	
Kansas G & E Co	40,000	60,000	60,000		
Kansas P & L Co	30,000		56,000		56,000
Kentucky Utilities Co		120,000		60,000	
Long Island Ltg Co	99,000	99,000	99,000	156,000	156,000
Louisiana P & L Co		99,000		125,000	
Louisville G & E Co	65,000		90,000		90,000
Maine P S Co				11,500	23,000
Metropolitan Edison Co		75,000			125,000
Minnesota P & L Co		88,000			44,000
Mississippi Pr Co		40,000			
Mississippi Pr & Lt Co		198,000			
Monongahela Pr Co	66,000		125,000		
Montaup Elec Co					60,000
Mt Carmel Utility's	7,500				
New England Elec System	71,400		50,000		
New Orleans P S Inc	33,500		82,000		
N. Y. State E & G Corp	50,000	100,000		135,000	
Niagara Mohawk	160,000	240,000	80,000		
Northern Indiana P S Co					125,000
Northern States Pr Co	66,000	40,000	90,000	90,000	
Ohio Edison Co		212,000	270,000		
Ohio Pr Co	125,000	351,500			
Ohio Valley Elec Corp				600,000	400,000
Oklahoma G & E Co		66,000		99,000	66,000
Pacific G & E Co	235,000	235,000	600,000	350,000	
Pennsylvania Elec Co	68,700	125,000	125,000		
Pennsylvania Pr Co	85,000				
Pennsylvania P & L Co		125,000	132,500		132,500
Pennsylvania Wtr & Pr			66,000		
Philadelphia Elec Co		250,000	150,000	200,000	250,000
Potomac Edison System	66,000				
Potomac Electric Pr Co	25,000		90,000	90,000	90,000
P S Co of Colorado		10,000	66,000	115,000	
P S Co of Indiana		180,000	180,000		
P S Co of N H	40,000			40,000	
P S Co of New Mexico	20,000	20,000	30,000		30,000
P S Co of Oklahoma	80,000		80,000		125,000
P S Elec & Gas Co		290,000	185,000		200,000
Rochester Gas & Elec		50,000			
Rockland L & P Co			66,000		
San Diego G & E Co	50,000		80,000		
Savannah E & P Co			20,000		
Scranton Elec Co		44,000			
South Carolina E & G		150,000		100,000	
Southern California Edison		200,000	125,000	125,000	125,000
Southern Colorado Pr					11,500
Southern Indiana G & E				40,000	
Southwestern G & E Co	30,000		40,000	60,000	75,000
Southwestern P S Co	56,000	80,000	80,000		
St Joseph L & P Co					30,000
Superior Water L & P	12,650				
Tampa Elec Co		40,000		60,000	
Texas Elec Service Co	119,000		176,000		156,000
Texas P & L Co		65,600	80,000	145,000	
Toledo Edison Co				125,000	
Tucson Gas Elec L & P		20,000	40,000		
Union Elec Co of Mo		110,000	110,000		
United Illuminating Co		30,000			
Utah P & L Co	75,000			66,000	
Virginia Elec & Pr Co	90,000	90,000	90,000		90,000
Western Colorado Pr Co		5,000		5,000	
Western Lt & Tel Co Inc		15,000			15,000
Western Mass. Elec Co	50,000				
Western P S Co				7,500	
West Penn Pr Co & Subs			125,000		
West Texas Utilities Co	3,000	66,000		33,000	
Wisconsin Elec Pr Co		120,000	120,000		
Wisconsin Pr & Lt Co		60,000		60,000	
Wisconsin P S Co & Subs			60,000		
Total	3,934,470	8,666,070	7,284,570	6,194,850	4,082,000

Electrical World—Kw

Steam Additions—Municipal, State Power District, Cooperative & Federal Projects

Reporting Systems	Added in 1952	1953	1954	1955	After 1955
Municipal, State, Power District & Cooperative Systems					
Austin, Texas	.....	.....	44,000	22,000	120,000
Braintree, Mass	7,500	.....	.....	.....	.....
Burbank, Cal	.....	20,000	.....	.....	.....
Central Pr Elec Coop	30,000	.....	.....	.....	.....
Chambersburg, Pa	.....	.....	.....	.....	10,000
Coffeyville, Kans	.....	.....	.....	.....	15,000
Colorado Springs, Col	.....	30,000	.....	.....	.....
Consumers Pub Pr District	7,500	.....	.....	7,500	.....
Dairyland Pr Coop	.....	30,000	.....	30,000	.....
Danville, Va	11,500	11,500	.....	.....	.....
Detroit, Mich	.....	.....	.....	.....	50,000
Dover, Ohio	.....	.....	7,500	.....	.....
Fairbury, Neb	.....	.....	.....	.....	5,000
Fairmont, Minn	.....	.....	.....	.....	7,500
Ft Collins, Col	.....	.....	.....	11,500	11,500
Fremont, Neb	.....	.....	.....	.....	15,000
Glendale, Cal	.....	20,000	.....	.....	.....
Greenwood, Miss	5,000	.....	.....	.....	.....
Hamilton, Ohio	.....	10,000	.....	.....	.....
Holland, Mich	11,500	.....	.....	.....	.....
Hope, Ark	.....	2,500	.....	.....	.....
Imperial Irrigation District	30,000	.....	.....	.....	.....
Jonesboro, Ark	.....	7,500	.....	.....	.....
Key West, Fla	10,000	.....	.....	7,500	.....
Lakeland, Fla	.....	.....	20,000	.....	20,000
Lamar, Col	5,000	.....	.....	.....	7,500
Lansdale, Pa	.....	.....	.....	.....	15,000
Lansing, Mich	.....	.....	.....	40,000	.....
Los Angeles, Cal	.....	100,000	256,000	156,000	.....
Lubbock, Texas	11,500	11,500	.....	.....	20,000
Menasha, Wisc	.....	7,500	.....	.....	.....
Muscatine, Iowa	.....	.....	.....	.....	25,000
Nebraska Public Pr System	.....	.....	.....	60,000	.....
Northeast Missouri Elec Pr Coop	7,500	7,500	.....	.....	.....
Northern Michigan Elec Coop	.....	15,000	.....	.....	7,500
Piqua, Ohio	12,500	.....	.....	.....	.....
Poplar Bluff, Mo	1,300	.....	.....	.....	.....
Pratt, Kansas	5,000	.....	.....	.....	10,000
Provo, Utah	.....	.....	.....	.....	11,500
Richmond, Indiana	.....	.....	30,000	.....	.....
San Antonio, Texas	.....	60,000	60 000	.....	.....
Salt River Power District	30,000	.....	69,000	.....	.....
South Haven, Mich	.....	.....	7,500	.....	.....
Tacoma, Wash	.....	.....	18,750	.....	.....
Vineland, N. J	7,500	.....	.....	10,000	.....
Winnetka, Illinois	.....	7,500	.....	.....	7,500
Yazoo City, Miss	.....	11,500	.....	.....	.....
Federal Systems					
TVA	672,500	1,035,000	1,755,000	1,575,000	225,000
Total	**865,800**	**1,387,000**	**2,307,750**	**1,879,500**	**583,000**

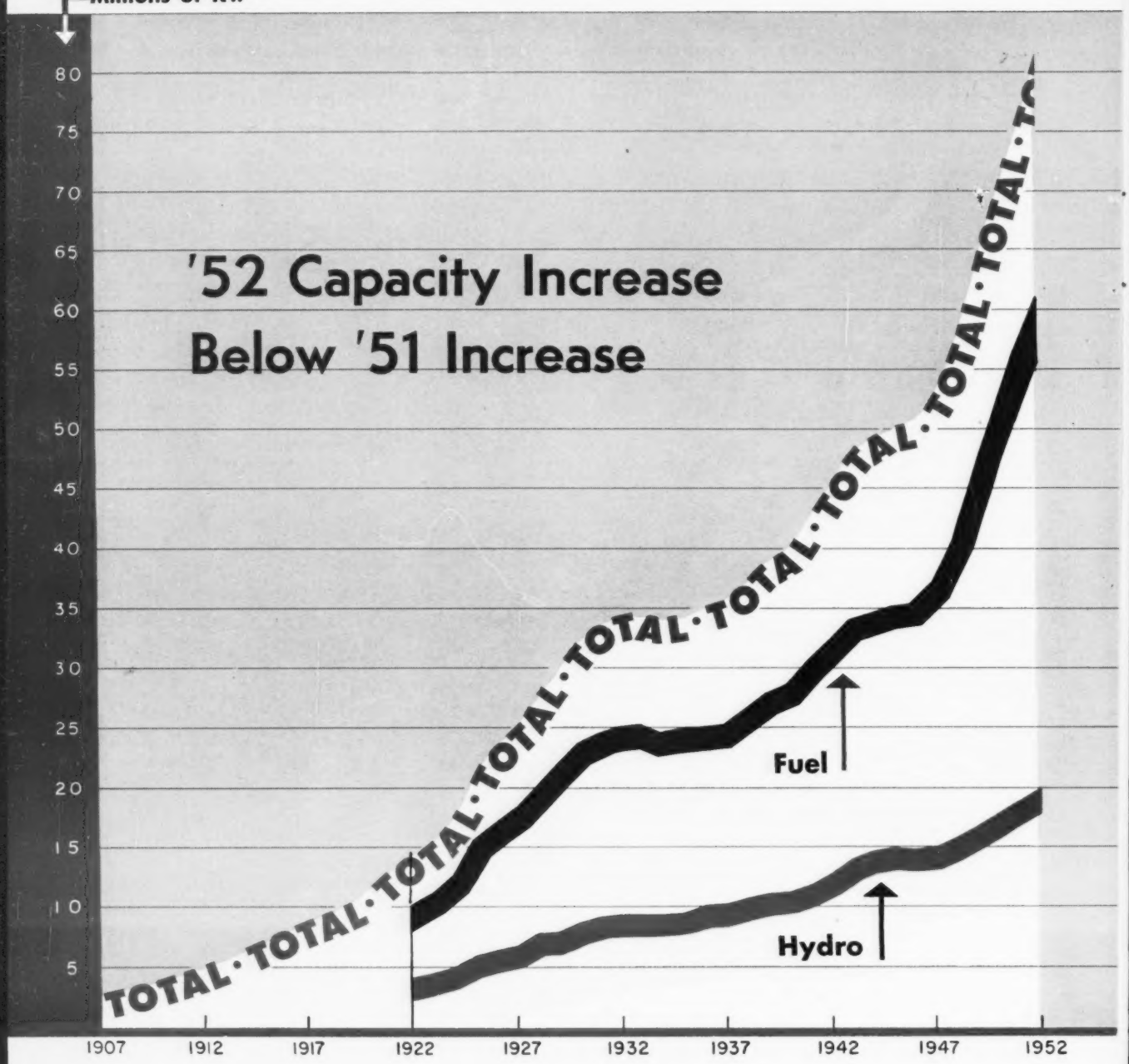
Hydro Additions—All Agencies

Power Companies					
Alabama Pr Co	55,200	.....	.....	.....	.....
California Oregon Pr Co	22,000	41,000	62,000	.....	100,000
Central Hudson G & E	.....	25,000	.....	.....	.....
Connecticut Lt & Pr Co	7,000	.....	.....	36,000	.....
Georgia Pr Co	22,500	22,500	.....	10,000	.....
Green Mt Pr Co	.....	5,500	.....	.....	.....
Idaho Pr Co	85,000	.....	.....	75,000	75,000
Maine P S Co	.....	.....	.....	.....	18,000
Montana Pr Co	.....	.....	56,000	.....	.....
Nantahala P & L Co	6,275	9,000	10,800	.....	.....
New England Elec System	.....	.....	.....	.....	140,400
Niagara Mohawk Pr Corp	30,000	.....	19,000	.....	.....
Northern States Pr Co & Subs	8,000	.....	.....	.....	.....
Northern States Pr Co (Wisc)	.....	.....	4,800	.....	.....
Pacific G & E Co	29,000	3,800	.....	84,000	687,500
Pacific P & L Co	108,000	.....	.....	.....	.....
Portland General Elec Co	5,000	14,400	.....	.....	.....
Rochester G & E Corp	3,600	.....	.....	.....	.....
Rockland L & P & Subs	.....	.....	18,000	.....	.....
Southern California Edison Co	.....	.....	.....	.....	126,000
Union Elec Co of Missouri	400	43,000	.....	.....	.....
Virginia Elec & Pr Co	.....	.....	.....	91,000	87,000
Washington Water Pr Co	100,000	100,000	.....	.....	.....
Total	**481,975**	**264,200**	**170,600**	**296,000**	**1,233,900**
Municipal, State, Power District & Cooperative Systems					
Garkane Pr Ass'n	.....	300	.....	500	2,000
Imperial Irrigation District	.....	10,000	.....	.....	33,000
Indian Elec Coop	.....	3,000	.....	.....	.....
Los Angeles, Cal	75,000	37,500	.....	.....	.....
Lower Valley Pr & Lt	.....	500	.....	.....	.....
Seattle, Wash	90,000	180,000	.....	90,000	.....
Tacoma, Wash	27,000	.....	40,000	420,000	.....
Federal Systems					
Bureau of Indian Affairs	.....	.....	.....	5,000	20,000
Bureau of Reclamation	372,500	272,084	175,667	100,500	1,299,100
Corps of Engineers	300,000	645,000	808,400	929,200	11,630,000
TVA	147,600	244,800	54,000	73,000	.....
Total	**1,012,100**	**1,393,184**	**1,078,067**	**1,617,700**	**12,984,100**

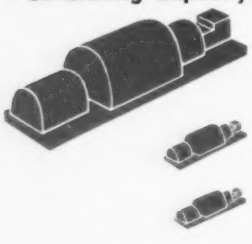
Internal Combustion Additions—All Agencies

Power Companies					
Bangor Hydro-Elec Co	5,000 G.T.	.....	.....	.....	.....
Central Vt. P S Corp & Subs	6,000 G.T.	6,000 G.T.	.....	.....	6,000 G.T.
Connecticut L & P Co	.....	20,000 G.T.	.....	.....	.....
Edison Sault Elec Co	1,440	840	1,440	.....	1,440
Florida Public Utilities Co	.....	.....	2,500	.....	.....
Iowa Elec Co	1,000	.....	.....	.....	.....
Iowa Elec L & P Co	1,150	.....	.....	.....	.....
Monongahela Pr Co	240	.....	.....	.....	.....
Nantucket G & E Co	.....	1,000	.....	.....	.....
New England Elec System	5,000	.....	5,000 G.T.	.....	.....
Northwestern L & P Co	1,136	.....	.....	.....	.....
Northwestern P S Co	2,500	.....	2,500	2,500	2,500
Oklahoma G & E Co	4,000 G.T. 175 IC	.....	.....	.....	.....
Otter Tail Pr Co	.....	3,000	.....	.....	.....
P S Co of Oklahoma	.....	.....	.....	15,000 G.T.	.....
Texas P & L Co	3,500 G.T.	.....	.....	.....	.....
Utah P & L Co	1,000	.....	.....	.....	.....
West Texas Utilities Co	5,000 G.T.	.....	4,000 G.T.	.....	.....
Total	**37,141**	**30,840**	**15,440**	**17,500**	**9,940**
Municipal, State, Power District & Cooperative Systems					
Bluffton, Indiana	5,000	.....	.....	.....	.....
Denton, Texas	2,500	2,700	.....	.....	.....
Federated Rural Elec Ass'n	1,230	.....	.....	.....	.....
Florida Keys Elec Coop Assn	.....	2,000	.....	.....	.....
Ft Wayne, Indiana	.....	.....	5,000 G.T.	5,000 G.T.	.....
Houma, La	.....	2,000	.....	.....	.....
Hudson, Mass	.....	.....	.....	3,000	.....
Key West, Fla	1,100	.....	.....	.....	.....
Medina Elec Coop	.....	13,500	.....	5,500	5,500
Nebraska City, Neb	1,500	1,500	.....	.....	8,500
Norwich, Conn	.....	.....	7,500	.....	7,500
Quakertown, Pa	.....	.....	1,500	.....	.....
Total	**11,330**	**21,700**	**14,000**	**13,500**	**21,500**

G.T. Gas Turbine. Installations



Generating Capacity by Ownership



Power Companies
78.6%

Federal Government
11.5%

Municipals, Cooperatives, Power Districts & State Projects
9.9%

National total rises to 81,975 Mw as 6,200 Mw are added in 1952. Thermal stations account for most of the increase. Private companies own 78.6%

Generating Capacity by Regions

Thousands of Kw

	1949			1950			1951			November 1, 1952		
	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel
New England	**3,890**	932	2,958	**4,052**	971	3,081	**4,255**	987	3,268	**4,594**	998	3,596
Mid. Atlantic	**12,624**	1,611	11,013	**13,225**	1,602	11,623	**14,210**	1,596	12,614	**14,486**	1,601	12,885
E. N. Central	**14,588**	763	13,825	**16,083**	828	15,255	**17,238**	858	16,380	**17,673**	856	16,816
W. N. Central	**4,556**	575	3,981	**5,024**	577	4,447	**5,580**	579	5,001	**5,761**	587	5,174
S. Atlantic	**7,988**	2,218	5,770	**8,857**	2,297	6,560	**9,794**	2,317	7,477	**10,475**	2,323	8,152
E. S. Central	**4,171**	2,562	1,609	**4,464**	2,721	1,743	**5,289**	2,991	2,299	**6,151**	3,292	2,859
W. S. Central	**4,005**	420	3,585	**4,717**	463	4,254	**5,462**	545	4,917	**5,947**	639	5,308
Mountain	**3,150**	2,197	953	**3,445**	2,282	1,163	**4,089**	2,623	1,466	**4,577**	3,057	1,521
Pacific	**8,130**	5,376	2,754	**9,054**	5,933	3,121	**9,857**	6,373	3,484	**10,114**	6,525	3,589
United States	**63,100**	16,654	46,446	**68,919**	17,675	51,244	**75,775**	18,868	56,907	**79,778**	19,878	59,900

Source: Federal Power Commission.

Generating Capacity by Ownership

Thousands of Kw

	Power Companies	Local †	Federal	Total Local and Federal
1937	31,958	2,829	833	3,662
1938	33,246	3,090	1,156	4,246
1939	33,908	3,305	1,650	4,955
1940	34,399	3,584	1,944	5,528
1941	36,041	3,933	2,371	6,364
1942	37,442	4,395	3,216	7,611
1943	39,128	4,501	4,322	8,823
1944	39,733	4,570	4,886	9,456
1945	40,307	4,723	5,081	9,804
1946	40,335	5,063	4,920	9,983
1947	41,986	5,308	5,027	10,335
1948	45,381	5,654	5,525	11,179
1949	50,484	6,406	6,210	12,616
1950	55,176	6,822	6,921	13,743
1951	60,192	7,484	8,099	15,583
1952*	62,717	7,882	9,179	17,061

Source: Federal Power Commission. *Data to November 1. †Includes municipals, cooperatives, power districts and state projects. 1940 and after excludes publicly owned transit systems.

Installed Capacity

Thousands of Kw

	Prime Mover		
	Fuel	Hydro	Total
1937	25,444	10,176	35,620
1938	26,835	10,657	37,492
1939	27,859	11,004	38,863
1940	28,703	11,224	39,927
1941	30,588	11,817	42,405
1942	32,211	12,842	45,053
1943	34,067	13,884	47,951
1944	34,603	14,586	49,189
1945	35,199	14,912	50,111
1946	35,468	14,849	50,317
1947	37,351	14,971	52,322
1948	40,908	15,652	56,560
1949	46,446	16,654	63,100
1950	51,244	17,675	68,919
1951	56,907	18,868	75,775
1952*	59,900	19,878	79,778

Source: Federal Power Commission. *Data to November 1.

Increase in net generating capacity during the year ended November 1, 1952 stands at 5,100 Mw. A probable increase of 6,200 Mw during 1952 has brought the year-end total to nearly 81,975 Mw.

Net increase during 1952 was approximately 700 Mw below the 6,856 Mw increase made during 1951. Shortages of critical material held back the industry's construction program.

The capacity of thermal stations showed the largest increase during the year ended November 1, 1952, having shown a net increase of 3,961 Mw. Probable increase during the calendar year of 4,868 Mw has brought the year-end capacity of thermal stations to an estimated 61,775 Mw.

Hydro stations showed an increase of 1,139 Mw during the year ended November 1, 1952. A probable increase during the calendar year of 1,332 Mw has brought year-end capacity of hydro stations to an estimated 20,200 Mw.

Largest regional increase in capacity during the 12 months ended November 1, 1951 was made in the East South Central region.

The 1,017 Mw addition made in this region represents nearly a 20% regional increase.

Number and Installed Capacity of Electric Utility Generating Plants By States and Type of Prime Mover

November 1, 1952

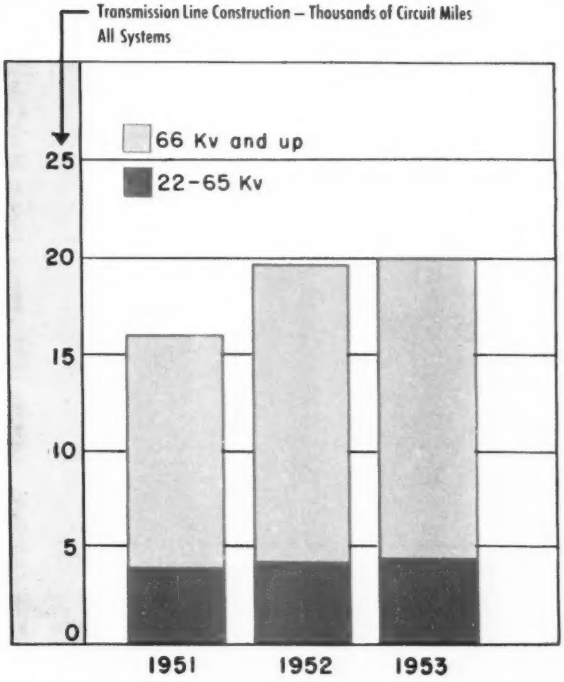
	Number of Utilities[a]	Number of Plants[b]	Total Capacity Kilowatts	Generator Capacity in Kilowatts of Plants Operated by[b]					
				Water Power		Steam Power		Internal Combustion Engines	
				Number	Capacity	Number	Capacity	Number	Capacity
UNITED STATES	**1,529**	**3,778**	**79,777,829**	**1,427**	**19,877,811**	**1,045**	**57,807,032**	**1,306**	**2,092,986**
New England	**98**	**317**	**4,593,820**	**212**	**998,065**	**69**	**3,520,820**	**36**	**74,935**
Maine	18	85	441,519	60	270,492	8	145,500	17	25,527
New Hampshire	11	49	441,474	42	262,184	6	177,250	1	2,040
Vermont	19	75	214,597	59	178,402	8	24,750	8	11,445
Massachusetts	34	71	2,033,124	33	182,292	31	1,827,130	7	23,702
Rhode Island	6	10	360,296	3	2,875	5	352,200	2	5,221
Connecticut	10	27	1,102,810	15	101,820	11	993,990	1	7,000
Middle Atlantic	**99**	**328**	**14,486,343**	**171**	**1,600,858**	**129**	**12,829,072**	**28**	**56,413**
New York	51	211	6,939,833	148	1,154,807	46	5,745,695	17	39,331
New Jersey	11	20	2,183,456	3	6,350	14	2,174,024	3	3,082
Pennsylvania	37	97	5,363,054	20	439,701	69	4,909,353	8	14,000
East North Central	**286**	**661**	**17,672,663**	**282**	**856,438**	**229**	**16,501,940**	**150**	**314,285**
Ohio	55	93	4,847,917	6	11,525	67	4,801,073	20	35,319
Indiana	45	69	2,436,140	14	35,170	39	2,359,340	16	41,630
Illinois	58	99	4,858,902	10	47,909	60	4,749,252	29	61,741
Michigan	62	206	3,557,683	128	394,773	33	3,038,975	45	123,935
Wisconsin	66	194	1,972,021	124	367,061	30	1,553,300	40	51,660
West North Central	**465**	**893**	**5,760,611**	**122**	**586,571**	**214**	**4,312,518**	**557**	**861,522**
Minnesota	80	176	1,324,479	41	144,622	51	1,023,327	84	156,530
Iowa	95	202	1,270,895	30	138,551	48	898,991	124	233,353
Missouri	73	114	1,161,747	7	151,073	31	882,965	76	127,709
North Dakota	14	45	205,040	.....	.....	17	168,040	28	37,000
South Dakota	39	75	198,127	6	4,621	10	121,850	59	71,656
Nebraska	78	147	656,671	33	141,519	21	422,945	93	92,207
Kansas	86	134	943,652	5	6,185	36	794,400	93	143,067
South Atlantic	**139**	**395**	**10,475,063**	**161**	**2,323,091**	**129**	**7,989,043**	**105**	**162,929**
Delaware	5	7	148,208	.....	.....	5	143,150	2	5,058
Maryland	12	27	1,198,331	3	271,325	13	911,600	11	15,406
District of Columbia	2	3	533,000	1	3,000	2	530,000	.....	.....
Virginia	23	74	1,276,564	38	182,578	18	1,068,804	18	25,182
West Virginia	12	35	1,711,716	10	100,880	17	1,606,640	8	4,196
North Carolina	29	85	2,074,544	51	668,150	20	1,378,771	14	27,623
South Carolina	12	41	1,067,192	27	652,595	8	409,000	6	5,597
Georgia	12	43	1,278,272	27	431,902	13	843,450	3	2,920
Florida	32	80	1,187,236	4	12,661	33	1,097,628	43	76,947
East South Central	**53**	**122**	**6,150,506**	**38**	**3,291,680**	**52**	**2,832,736**	**32**	**26,090**
Kentucky	13	30	1,200,568	5	540,860	21	653,300	4	6,408
Tennessee	12	36	2,342,663	21	1,459,600	11	878,450	4	4,613
Alabama	4	23	2,226,620	12	1,291,220	8	933,000	3	2,400
Mississippi	24	33	380,655	.....	.....	12	367,986	21	12,669
West South Central	**166**	**373**	**5,947,122**	**34**	**639,374**	**105**	**4,972,565**	**234**	**335,183**
Arkansas	18	35	668,169	7	233,340	13	411,645	15	23,184
Louisiana	30	60	1,025,993	.....	.....	14	957,450	46	68,543
Oklahoma	49	94	905,795	4	87,824	23	741,970	67	76,001
Texas	69	184	3,347,165	23	318,210	55	2,861,500	106	167,455
Mountain	**165**	**400**	**4,577,232**	**195**	**3,056,512**	**68**	**1,314,783**	**137**	**205,937**
Montana	11	29	613,049	18	532,120	5	77,968	6	2,961
Idaho	13	51	591,084	43	586,180	1	400	7	4,504
Wyoming	25	51	187,701	19	106,997	11	69,320	21	11,384
Colorado	42	83	625,826	29	143,735	22	448,873	32	33,218
New Mexico	21	40	340,091	4	24,910	14	273,972	22	41,209
Arizona	19	49	1,319,480	13	982,180	10	258,000	26	79,300
Utah	26	80	304,523	59	94,165	5	186,250	16	24,108
Nevada	8	17	595,478	10	586,225	.....	.....	7	9,253
Pacific	**58**	**289**	**10,114,469**	**212**	**6,525,222**	**50**	**3,533,555**	**27**	**55,692**
Washington	20	54	3,164,437	38	2,962,536	9	197,820	7	4,081
Oregon	18	67	1,004,699	48	799,519	12	198,710	7	6,470
California	20	168	5,945,333	126	2,763,167	29	3,137,025	13	45,141

Source: Federal Power Commission

Notes: [a] Total includes 81 duplications because of utilities having generating plants in more than one state.
[b] For the approximately 154 combination plants, each type of prime mover is counted as a separate plant.

Primary Line Building Slows

T & D section augmented and improved. Primary distribution data added. Transmission study revised to reflect industry's current thinking.



The industry's plans to build nearly 70,000 miles of primary distribution line, 25 kv and below, fall nearly 30,000 miles short of 1952 construction.

Data on line construction for 1951-1953 clearly indicate a downward trend. Largest cut is that planned by the cooperatives. Having built 90,000 miles during 1951 and 68,500 in 1952, they plan to add only 41,000 miles during 1953.

The lower bracket of the survey's transmission line voltage has been revised to include only lines 22 kv to 65 kv, this bracket having been found more useful in making comparisons.

Construction of transmission lines in both high and low voltage brackets shows moderate gains during 1953 totalling 352 circuit miles.

Increase in substation construction is, however, much more substantial. Planned construction of 30.4 million kva during 1953 represents an increase of nearly 20%. Budgeted expenditures of nearly $\$1/2$ billion top those of 1952 by 21.4%.

Primary Distribution Line Construction†

	1951	1952	1953
Private Companies	29,217	25,645	23,999
Municipal, State & Power District Systems	3,760	2,962	2,892
Cooperatives	90,000	68,500	41,000
Federal Agencies	40	36	50
Total	123,017	97,143	67,941

Source: "Electrical World" Survey. † Pole miles 25 kv and below.

Substation Construction

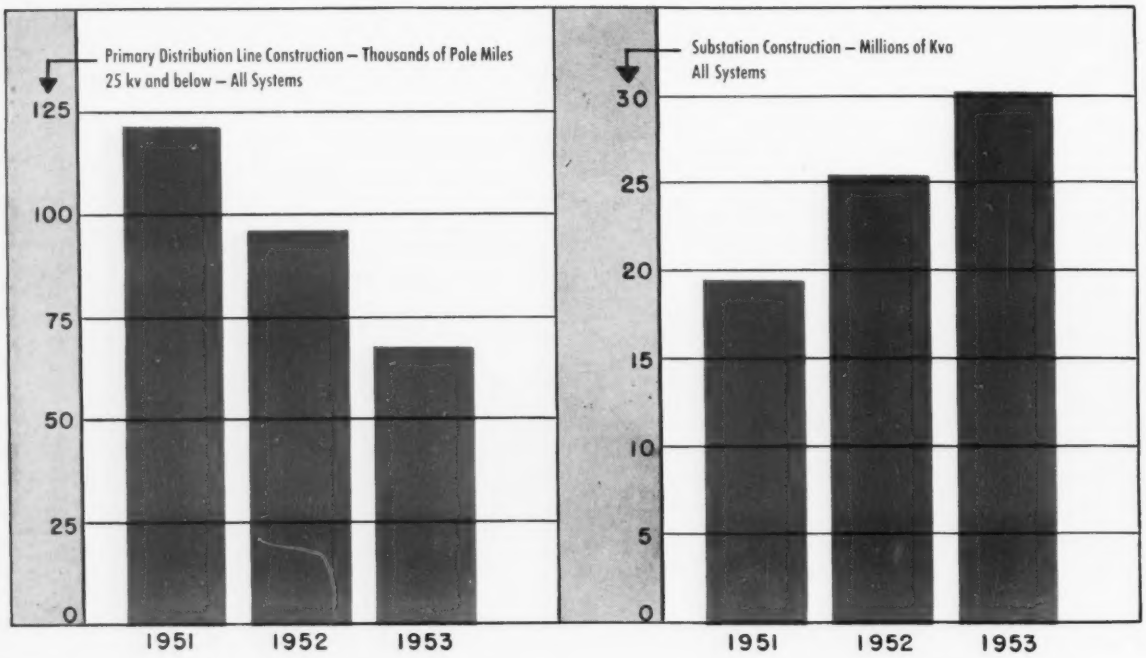
	1952		1953	
	Thousands of Kva	Thousands of Dollars	Thousands of Kva	Thousands of Dollars
Private Companies	18,878	299,936	22,358	360,261
Municipal, State & Power District Systems	1,940	31,026	2,269	41,175
Cooperatives	685	9,590	911	12,754
Federal Agencies	4,053	69,838	4,832	83,919
Total	25,556	410,390	30,370	498,109

Source: "Electrical World" Survey.

Circuit Miles of Transmission Line Construction

	1952		1953	
	22-65 kv	66 kv and up	22-65 kv	66 kv and up
Power Companies	2,812	8,592	3,220	10,044
Municipal, State & Power District Systems	238	1,194	395	974
Cooperatives	1,050	2,450	680	2,720
Federal Agencies	98	3,239	100	1,892
Total	4,198	15,475	4,395	15,630

Source: "Electrical World" Survey.



Substation Construction—Thousands of Dollars
Private, Municipal, State & Power District Systems

	1949	1950	1951	1952	1953
New England..	14,337	14,631	10,463	13,979	16,667
Mid. Atlantic.	37,793	42,495	46,861	59,990	73,925
E. N. Central..	54,015	59,847	56,940	88,859	109,745
W. N. Central.	47,766	27,784	16,744	24,009	30,477
S. Atlantic....	43,608	34,426	38,358	39,212	46,991
E. S. Central...	14,859	7,337	11,938	14,250	15,594
W. S. Central..	32,446	29,165	29,546	35,294	43,186
Mountain.....	15,048	10,432	9,440	8,704	10,956
Pacific.....	57,667	42,697	53,920	46,665	53,895
United States..	**317,541**	**268,814**	**274,210**	**330,962**	**401,436**

Source: "Electrical World" Surveys.

Substation Construction—Thousands of Kva
Private, Municipal, State & Power District Systems

	1949*	1950*	1951	1952	1953
New England...	546	717	784	935	633
Mid Atlantic...	1,950	2,658	2,065	2,403	3,712
E. N. Central...	3,887	3,972	4,331	5,017	6,457
W. N. Central..	1,936	2,229	1,258	1,381	2,205
S. Atlantic.....	2,545	2,848	2,309	3,701	3,256
E. S. Central....	943	1,871	796	1,365	1,736
W. S. Central...	2,284	2,609	1,950	2,323	2,674
Mountain.....	912	817	667	613	669
Pacific.....	2,775	2,094	2,086	3,080	3,286
United States...	**17,779**	**19,815**	**16,246**	**20,818**	**24,627**

Source: "Electrical World" Surveys. * Include TVA.

Circuit Miles of Transmission Line Construction
Private, Municipal, State & Power District Systems

	1951		1952		1953	
	22-65 kv	66 kv and up	22-65 kv	66 kv and up	22-65 kv	66 kv and up
New England.	111	160	64	214	137	189
Mid. Atlantic.	406	303	402	487	573	735
E. N. Central..	710	1,361	834	1,783	1,153	2,753
W. N. Central	437	886	597	1,495	455	1,239
S. Atlantic...	327	1,411	413	1,607	362	1,821
E. S. Central..	152	429	178	335	142	498
W. S. Central.	173	1,407	140	1,807	118	2,030
Mountain....	442	522	168	381	406	735
Pacific.....	444	1,087	254	1,677	269	1,018
United States.	**3,202**	**7,566**	**3,050**	**9,786**	**3,615**	**11,018**

Source: "Electrical World" Surveys.

Primary Distribution Line Construction†
Private, Municipal, State & Power District Systems

	1951	1952	1953
New England.....	590	733	634
Middle Atlantic.....	2,570	2,486	2,428
East North Central.....	3,611	3,134	2,902
West North Central.....	1,809	1,569	1,412
South Atlantic.....	9,002	7,553	6,521
East South Central.....	4,418	3,628	3,273
West South Central.....	4,863	4,506	4,708
Mountain.....	1,784	1,769	1,718
Pacific.....	4,330	3,229	3,295
**Total.....	**32,977**	**28,607**	**26,891**

Source: "Electrical World" Survey. † Pole miles 25 kv and below.

Circuit Miles of Overhead Line

Circuit Miles by States

State	1951	1950	1949
UNITED STATES	**250,132**	**238,466**	**224,610**
New England	**8,265**	**7,929**	**7,781**
Maine	2,149	2,044	1,950
New Hampshire	1,419	1,367	1,357
Vermont	734	697	688
Massachusetts	2,402	2,355	2,312
Rhode Island	424	417	433
Connecticut	1,137	1,049	1,041
Middle Atlantic	**23,953**	**23,618**	**22,923**
New York	10,525	10,491	10,106
New Jersey	3,145	3,096	3,059
Pennsylvania	10,283	10,031	9,758
East No. Central	**45,359**	**43,476**	**41,180**
Ohio	10,539	10,216	9,898
Indiana	7,708	7,608	7,174
Illinois	10,918	10,322	9,742
Michigan	8,832	8,148	7,819
Wisconsin	7,362	7,182	6,547
West No. Central	**34,535**	**32,314**	**30,862**
Minnesota	5,807	5,423	5,157
Iowa	6,263	5,477	5,385
Missouri	5,937	5,564	5,410
North Dakota	3,821	3,667	3,295
South Dakota	2,356	2,445	2,514
Nebraska	4,654	4,474	4,002
Kansas	5,697	5,264	5,099
South Atlantic	**29,879**	**28,399**	**26,227**
Delaware	367	350	349
Maryland & D. C.	2,088	1,957	1,734
Virginia	3,303	3,060	2,976
West Virginia	4,002	3,740	3,650
North Carolina *	7,937	7,671	6,764
South Carolina	2,620	2,468	2,130
Georgia	5,727	5,501	5,141
Florida	3,835	3,652	3,483
East So. Central	**19,217**	**17,870**	**17,264**
Kentucky	4,582	4,351	4,184
Tennessee	5,513	4,998	4,855
Alabama	6,043	5,852	5,751
Mississippi	3,079	2,669	2,474
West So. Central	**30,775**	**29,075**	**26,889**
Arkansas	3,878	3,594	3,238
Louisiana	3,399	2,898	2,778
Oklahoma	5,421	5,174	4,947
Texas	18,077	17,409	15,926
Mountain	**23,177**	**22,201**	**20,185**
Montana	5,299	5,105	5,087
Idaho	4,210	3,893	3,648
Wyoming	2,064	2,018	1,612
Colorado	2,977	2,784	2,254
New Mexico	809	689	607
Arizona	3,077	3,036	2,384
Utah	3,057	2,941	2,929
Nevada	1,684	1,735	1,664
Pacific	**34,972**	**33,584**	**31,299**
Washington	7,967	7,951	** 7,638
Oregon	4,222	3,959	2,967
California	22,783	21,674	20,694

Notes: * Includes line located in South Carolina
** Includes line located in Oregon & Idaho.

Study does not include the following miles of line operated by rural cooperatives:

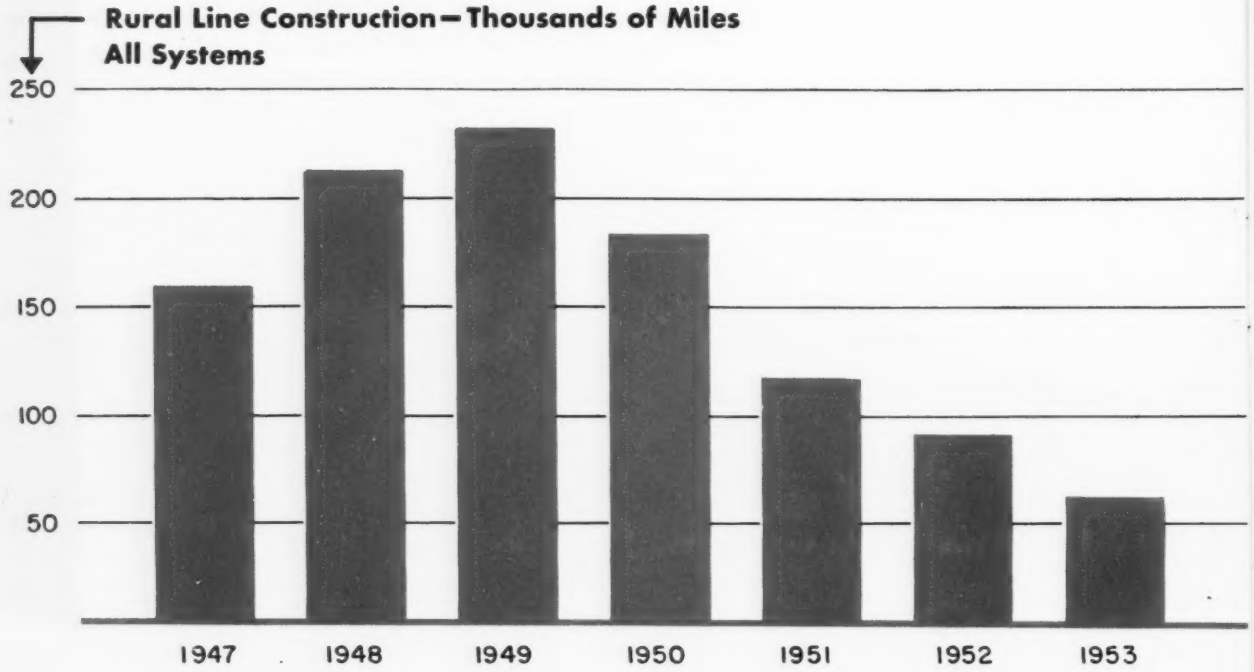
1948.... 8,000 1950....10,300
1949.... 9,600 1951....13,000

Circuit Miles by Voltage

Voltage	1951	1950	1949
Total	**250,132**	**238,466**	**224,610**
22,000	9,318	9,517	8,713
23,000	4,730	4,569	3,454
24,000	3,456	3,611	4,080
25,000	1,983	1,925	2,103
26,000	180	174	374
26,400	1,717	1,688	1,655
27,000	9	3	6
27,600	650	640	629
28,000	.....	.....	29
30,000	15	15	.....
33,000	31,574	32,667	34,091
34,000	18	18	18
34,500	22,350	18,837	15,047
35,000	307	312	342
36,000	206	210	921
36,400	197	183	.....
38,000	1,072	2,300	2,076
38,100	85	99	102
39,500	35	35	158
40,000	1,296	1,110	918
41,000	1,139	.....	.....
41,600	2,770	2,685	2,522
44,000	19,674	19,131	19,473
45,000	132	112	112
45,800	78	.....	.....
46,000	1,439	1,217	1,291
47,000	126	120	258
50,000	2,095	1,683	1,687
55,000	1,264	1,581	1,473
57,000	1,605	1,531	1,266
60,000	6,931	6,787	6,732
66,000	32,252	31,601	32,815
67,000	170	.....	.....
69,000	18,118	16,696	12,790
70,000	1,525	1,563	1,543
72,000	182	177	182
75,000	59	59	75
80,000	128	128	128
85,000	.....	.....	.....
88,000	690	652	1,203
92,000	300	300	.....
100,000	4,206	4,059	1,708
110,000	22,338	21,063	23,527
114,000	1,100	1,440	577
115,000	13,031	11,969	9,863
120,000	1,129	1,021	890
132,000	12,384	12,753	11,562
138,000	7,899	6,011	4,292
140,000	1,702	1,449	1,404
150,000	.....	.....	.....
154,000	5,301	4,626	3,963
161,000	1,637	1,612	1,392
165,000	297	297	298
220,000	4,857	4,644	4,294
230,000	3,585	2,795	1,883
287,500	791	791	791

Source: Edison Electric Institute

RURAL ELECTRIFICATION



Fewer New Rural Lines in '53

Rural Primary Distribution Line Construction†

	1951	1952	1953
Private Companies	21,531	17,587	15,239
Municipal, State & Power District Systems	3,096	2,453	2,161
Cooperatives	90,000	68,500	41,000
Federal Agencies	15	20	40
Total	**114,642**	**88,560**	**58,440**

Source: "Electrical World" Survey. † Pole miles 25 kv and below.

Rural Line Construction—Thousands of Dollars

	1952	1953
Private Companies	62,770	52,053
Federal, Municipal, State & Power District Systems	8,773	9,999
Cooperatives	128,780	115,254
Total	**200,323**	**177,306**

Source: "Electrical World" Survey.

Pole Miles of Rural Primary Line—25 kv and below Private, Municipal, State & Power District Systems

	1951	1952	1953
New England	362	219	195
Middle Atlantic	1,404	1,185	1,154
East North Central	2,034	1,903	1,574
West North Central	1,741	1,198	922
South Atlantic	7,589	5,645	3,931
East South Central	3,342	3,129	2,881
West South Central	3,734	3,158	3,092
Mountain	1,322	1,234	1,230
Pacific	3,099	2,369	2,421
United States	**24,627**	**20,040**	**17,400**

Source: "Electrical World" Surveys.

Rural Line Construction—Thousands of Dollars Private Municipal, State & Power District Systems

	1951	1952	1953
New England	1,384	672	606
Middle Atlantic	5,957	3,898	3,826
East North Central	7,893	10,338	9,069
West North Central	3,887	4,233	3,709
South Atlantic	12,217	14,480	10,910
East South Central	4,902	6,487	7,297
West South Central	9,042	11,231	9,826
Mountain	4,211	5,105	5,306
Pacific	11,404	15,049	11,351
United States	**60,897**	**71,493**	**61,900**

Source: "Electrical World" Surveys.

Rural line construction during 1953 will show a substantial decrease. Plans call for 58,440 miles—nearly 30,000 miles less than 1952's 88,560-mile construction program.

This 34% decrease is a continuation of a trend which has existed since 1949—peak year of the rural construction program.

Electric cooperatives, responsible for 77% of 1952's rural extensions, show the largest decrease. They plan to build approximately 27,500 fewer miles of line in 1953 than they did in 1952. This is a 40% cut.

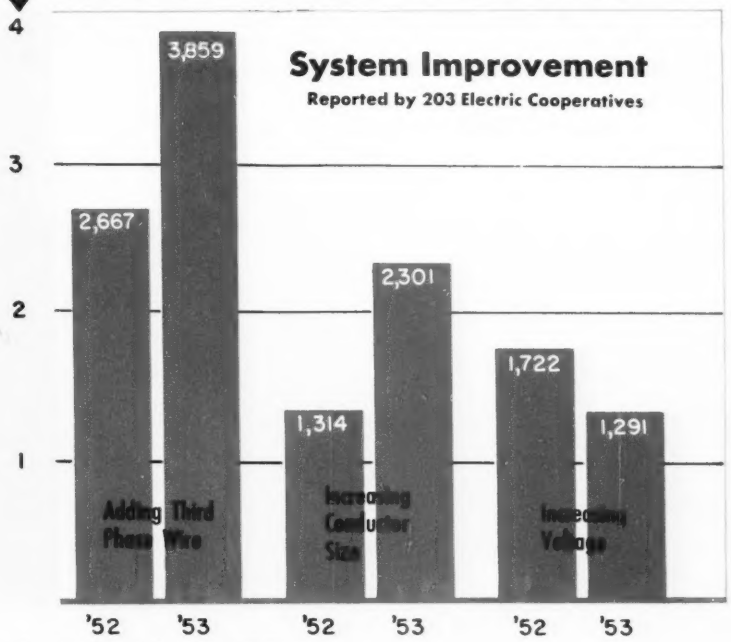
Planned reduction in construction by all agencies is reflected in 1953's budget. Expenditures for rural line construction will be approximately $23 million below the $200 million spent during 1952—an 11% reduction.

Increased use of electricity by the American farmer has required substantial strengthening of existing systems. The extent of this activity is clearly indicated by the reply of 203 cooperatives to Electrical World's query on system improvement. The response indicates that cut-backs in construction will be offset, to some degree, by system improvement and that the addition of a third phase again leads other methods.

The REA Reports . . . Statistics prepared by the Rural Electrification Administration for Electrical World show the operating and financial condition of REA-financed systems.

Average annual energy use per co-op consumer, the REA also reports, rose to approximately 3,076 kwhr during 1952. This is an increase of 345 kwhr, 12.6%, over the 2,731 consumed during 1951. In 1950 this figure stood at 2,411. Increases in use of energy raised the average co-op consumer's bill to $86.30 in 1952.

Thousand Miles of Rural Line Improvement



Source: "Electrical World" Survey

Statistics of REA-Financed Systems

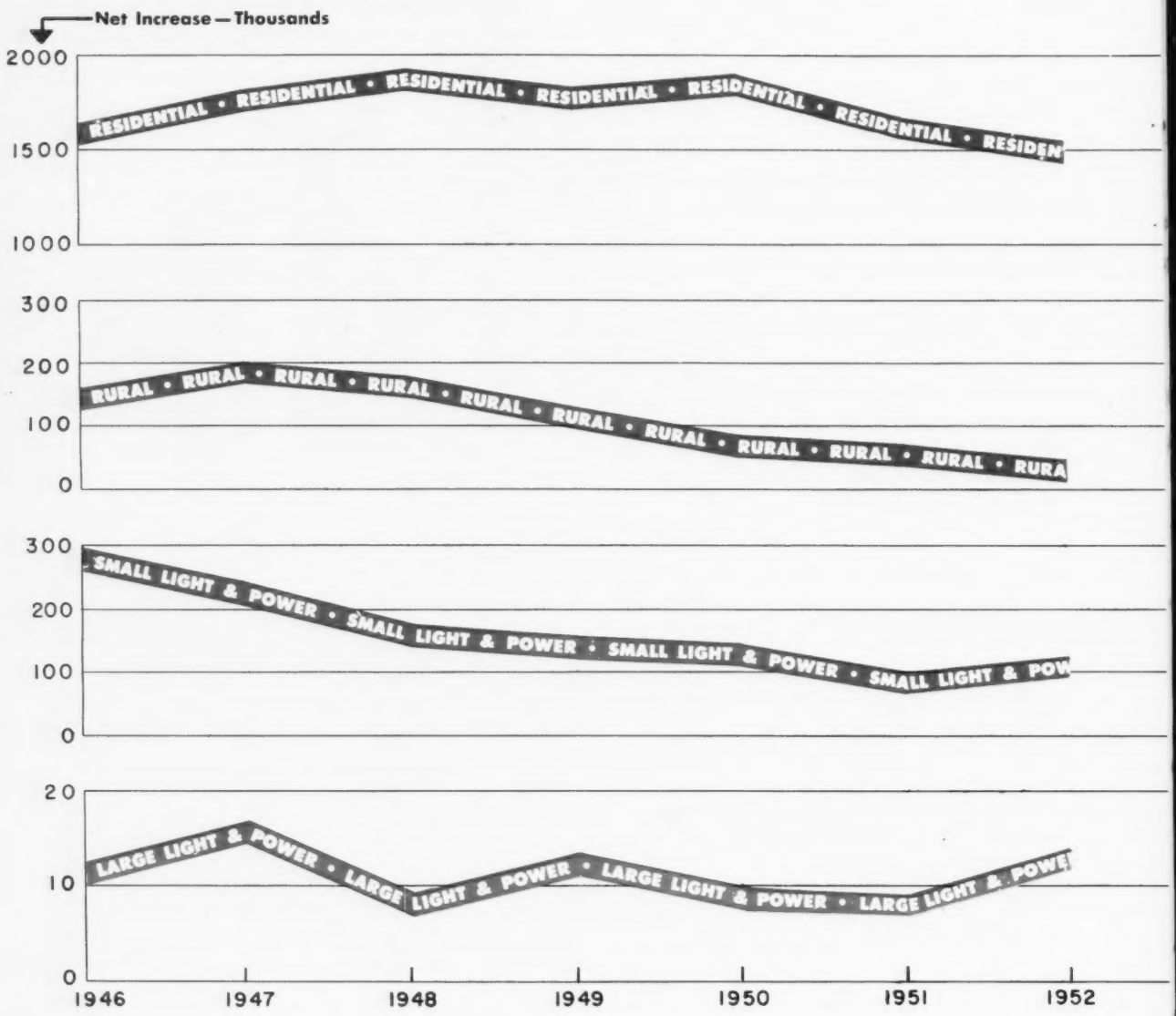
	1950	1951 [1]	1952 [2]
Cumulative Year-end Data			
Total Loans Approved	$2,311,636,614	$2,484,443,832	$2,668,946,121
Distribution Lines	$1,879,150,367	$2,015,303,923	$2,137,839,562
Generation and Transmission	$413,230,101	$447,643,025	$506,394,794
Consumer Facilities	$19,256,146	$21,496,884	$24,711,765
Funds Advanced	$1,706,207,276	$1,944,860,101	$2,157,945,000
Systems in Operation	1,007	1,012	1,019
Miles of Line in Operation	1,088,777	1,177,234	1,240,000
Consumers Connected	3,413,407	3,657,502	3,875,000
Systems Generating Power During Year	100	91	90
Generating Plants—Kw Capacity	413,162	598,000	641,000
Annual Data			
Energy Generated—Kwhr	1,076,945,615	1,384,541,502	1,677,000,000
Energy Purchased—Kwhr	8,164,801,159	9,961,744,216	11,823,000,000
Total System Input—Kwhr	9,241,746,774	11,346,285,718	13,500,000,000
Energy Sold—Kwhr	7,778,734,502	9,655,486,127	11,584,000,000
Operating Revenues	$241,342,540[4]	$285,074,443	$325,000,000
Cost of Power[3]	$79,402,275	$94,139,458	$107,400,000
Distribution Expenses—Operations	$18,235,988	$21,723,856	$24,900,000
Distribution Expenses—Maintenance	$10,515,766	$12,447,248	$13,800,000
Consumers Accounting & Collecting	$9,112,801	$10,664,729	$12,600,000
All Other Operating Expenses	$32,049,916	$37,348,332	$41,600,000
Total Operating Expenses	$149,316,746	$176,323,623	$200,300,000
Net Non-Operating Margin	$834,803	$1,002,787	$1,100,000
Interest Expenses	$26,110,181	$30,722,472	$34,500,000
Net Revenue Before Depreciation	$66,576,952[5]	$78,789,610[5]	$91,300,000
Depreciation	$47,675,975	$56,829,649	$63,900,000
Net Margin After Depreciation	$18,900,977	$21,959,961	$27,400,000

Source: Monthly Operating Reports of REA borrowers and records of the REA.

[1] Preliminary.
[2] Based on nine (9) months actual data and one (1) to three (3) months estimated.
[3] Cost of Power includes cost of purchased power and prime costs involved in the production and transmission of generated energy.
[4] Does not include revenues reported by REA borrowers from whom figures for other items were not available: $30,687 for 3 borrowers for 1950.
[5] After deducting miscellaneous revenue deductions not shown separately: $173,464 for 1950 and $241,525 for 1951.

How Many New Customers

does the electric utility industry add each year?



Net Increase of Customers by Class of Service

	1947	1948	1949	1950	1951	Nov. 1 1952*
Residential	1,819,352	1,922,037	1,828,070	1,890,183	1,662,072	1,269,615
Rural	202,345	179,843	130,736	86,731	66,582	34,123
Small Light & Power	240,045	172,535	150,738	140,413	92,636	98,088
Large Light & Power	16,701	9,167	13,195	9,603	9,004	11,630
Street Lighting	2,530	1,368	1,255	2,080	1,040	1,419
Other Public Authorities	11,022	5,114	4,751	6,442	4,243	2,539
Street Railways	−25	−16	−5	1	0	−14
Electrified Steam Railroads	0	−1	0	−3	−3	1
Interdepartmental	−311	−9	53	63	11	116
Total	**2,291,659**	**2,290,038**	**2,128,793**	**2,135,513**	**1,835,585**	**1,417,517**

Source: Edison Electric Institute.

Customer

Over 1.5 million new customers were added by electric utilities during 1952, bringing the total to about 48.5 million. This increase represents an expected leveling-off from the phenomenal rate of growth, averag-

Customers by States and Classification

	Total		Residential and Rural		Small Light and Power		Large Light and Power		Other†	
	1951	Nov. 1 1952	1951	Nov. 1 1952	1951	Nov. 1 1952	1951	Nov. 1 1952	1951	Nov. 1 1952
UNITED STATES	**46,821,879**	**48,239,396**	**40,883,349**	**42,188,787**	**5,528,117**	**5,633,305**	**247,532**	**259,162**	**162,881**	**157,942**
New England	**3,158,570**	**3,252,204**	**2,756,663**	**2,841,762**	**371,726**	**380,297**	**18,203**	**18,825**	**11,978**	**11,320**
Maine	319,047	330,554	273,506	283,276	38,235	39,711	4,032	4,194	3,274	3,373
New Hampshire	203,759	217,693	178,121	190,896	22,541	23,704	648	593	2,449	2,500
Vermont	128,590	130,549	112,421	114,011	14,849	15,171	184	189	1,136	1,178
Massachusetts	1,558,738	1,596,903	1,361,066	1,396,694	185,855	188,835	7,627	7,954	4,190	3,420
Rhode Island	264,685	271,628	231,876	237,821	30,972	31,932	1,399	1,410	438	465
Connecticut	683,751	704,877	599,673	619,064	79,274	80,944	4,313	4,485	491	384
Middle Atlantic	**9,774,324**	**9,998,597**	**8,408,564**	**8,610,477**	**1,297,210**	**1,317,429**	**41,004**	**42,121**	**27,546**	**28,570**
New York	4,884,412	4,970,466	4,163,680	4,240,830	696,615	704,468	7,501	7,702	16,616	17,286
New Jersey	1,662,799	1,728,781	1,439,349	1,498,906	213,342	219,452	8,089	8,304	2,019	2,119
Pennsylvania	3,227,113	3,299,350	2,805,535	2,870,741	387,253	393,329	25,414	26,115	8,911	9,165
East North Central	**9,764,012**	**9,986,336**	**8,612,240**	**8,816,415**	**1,071,592**	**1,087,739**	**47,698**	**49,047**	**32,482**	**33,135**
Ohio	2,552,584	2,611,741	2,254,430	2,308,575	272,453	276,397	12,638	13,386	13,063	13,383
Indiana	1,316,260	1,347,377	1,157,891	1,187,021	143,879	145,550	8,102	8,228	6,388	6,578
Illinois	2,686,334	2,743,298	2,344,314	2,395,653	312,805	318,049	21,634	21,944	7,581	7,652
Michigan	2,069,813	2,117,944	1,843,359	1,887,624	220,452	224,237	3,179	3,255	2,823	2,828
Wisconsin	1,139,021	1,165,976	1,012,246	1,037,542	122,003	123,506	2,145	2,234	2,627	2,694
West North Central	**4,532,605**	**4,647,090**	**3,962,202**	**4,068,255**	**541,257**	**549,889**	**15,720**	**16,399**	**13,426**	**12,547**
Minnesota	1,010,541	1,035,230	893,407	917,008	113,593	114,201	1,429	1,898	2,112	2,123
Iowa	872,377	885,087	752,784	763,790	110,813	112,350	6,565	6,695	2,215	2,252
Missouri	1,230,779	1,259,243	1,087,494	1,113,364	138,101	141,215	2,624	2,665	2,560	1,999
North Dakota	179,188	185,382	153,715	159,439	24,892	25,331	56	78	525	534
South Dakota	191,466	198,620	164,071	170,609	26,504	27,106	59	56	832	849
Nebraska	420,080	430,397	361,870	371,055	54,462	55,514	819	841	2,929	2,987
Kansas	628,174	653,131	548,861	572,990	72,892	74,172	4,168	4,166	2,253	1,803
South Atlantic	**5,866,566**	**6,108,930**	**5,185,639**	**5,413,022**	**640,910**	**655,453**	**20,866**	**21,248**	**19,151**	**19,207**
Delaware	108,299	113,958	94,516	99,334	13,244	14,081	409	412	130	131
Maryland, District of Columbia	876,546	904,741	762,401	788,622	108,510	110,387	5,104	5,183	531	549
Virginia	858,148	889,987	759,095	787,439	91,411	94,533	1,447	1,530	6,195	6,485
West Virginia	548,637	560,041	484,824	494,965	58,336	59,573	2,425	2,405	3,052	3,098
North Carolina, South Carolina	1,676,031	1,769,949	1,504,354	1,597,190	163,194	164,433	4,157	4,359	4,326	3,967
Georgia	875,610	915,893	781,040	818,585	91,662	94,441	1,773	1,800	1,135	1,067
Florida	923,295	954,361	799,409	826,887	114,553	118,005	5,551	5,559	3,782	3,910
East South Central	**2,853,828**	**2,965,768**	**2,563,338**	**2,671,667**	**262,335**	**273,602**	**11,716**	**12,687**	**15,439**	**7,812**
Kentucky	755,006	780,476	674,328	699,277	72,556	73,517	2,938	2,893	5,184	4,789
Tennessee	873,970	908,488	786,789	820,952	78,094	83,688	2,517	2,883	6,570	965
Alabama	758,493	782,714	689,348	711,775	64,217	66,504	3,205	3,488	1,723	947
Mississippi	466,359	494,090	412,873	439,663	48,468	49,893	3,056	3,423	1,962	1,111
West South Central	**4,105,348**	**4,260,575**	**3,606,308**	**3,747,264**	**450,220**	**460,784**	**31,971**	**34,362**	**16,849**	**18,165**
Arkansas	485,214	496,719	435,433	445,714	46,258	47,198	2,527	2,831	996	976
Louisiana	707,079	736,203	620,777	647,908	78,255	79,930	5,442	5,545	2,605	2,820
Oklahoma	667,703	692,305	587,729	610,850	70,280	71,228	6,486	6,962	3,208	3,265
Texas	2,245,352	2,335,348	1,962,369	2,042,792	255,427	262,428	17,516	19,024	10,040	11,104
Mountain	**1,571,795**	**1,643,231**	**1,366,663**	**1,429,106**	**183,426**	**191,410**	**16,853**	**17,608**	**4,841**	**5,107**
Montana	187,639	194,526	162,281	168,125	22,120	22,834	2,659	2,969	579	598
Idaho	200,246	207,005	173,725	178,060	25,513	28,149	702	455	306	341
Wyoming	86,519	90,405	74,964	78,680	9,921	10,051	1,476	1,515	158	159
Colorado	432,775	454,836	373,157	394,443	49,446	50,022	8,345	8,456	1,827	1,915
New Mexico	181,005	193,344	159,480	170,973	20,215	21,027	687	691	623	653
Arizona	222,736	234,110	192,049	200,976	29,124	30,954	1,013	1,551	550	629
Utah	207,758	211,399	187,427	190,514	17,773	18,309	1,880	1,886	678	690
Nevada	53,117	57,606	43,580	47,335	9,324	10,064	93	85	120	122
Pacific	**5,194,831**	**5,376,665**	**4,421,732**	**4,590,819**	**708,431**	**716,902**	**43,499**	**46,865**	**21,169**	**22,079**
Washington	784,444	800,817	693,431	711,051	85,849	84,393	3,204	3,302	1,960	2,071
Oregon	520,835	534,377	448,280	459,282	68,812	70,430	1,663	2,501	2,080	2,164
California	3,889,552	4,041,471	3,280,021	3,420,486	553,770	562,079	38,632	41,062	17,129	17,844

Source: Edison Electric Institute. † Includes Street and Highway Lighting, Other Public Authorities, Railways and Railroads and Interdepartmental.

Growth Leveling Off

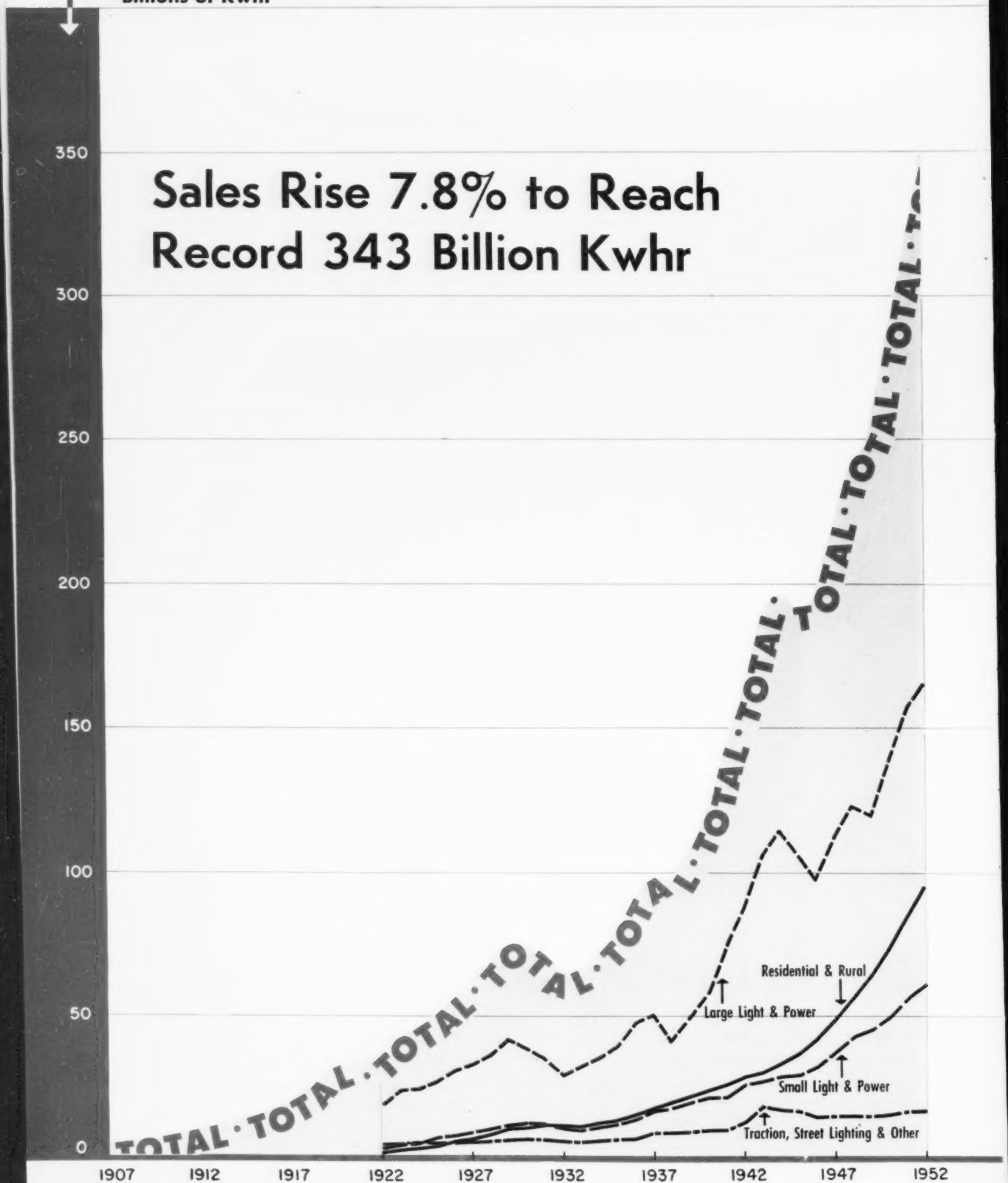
ing better than 2 million customers a year, experienced since World War II.

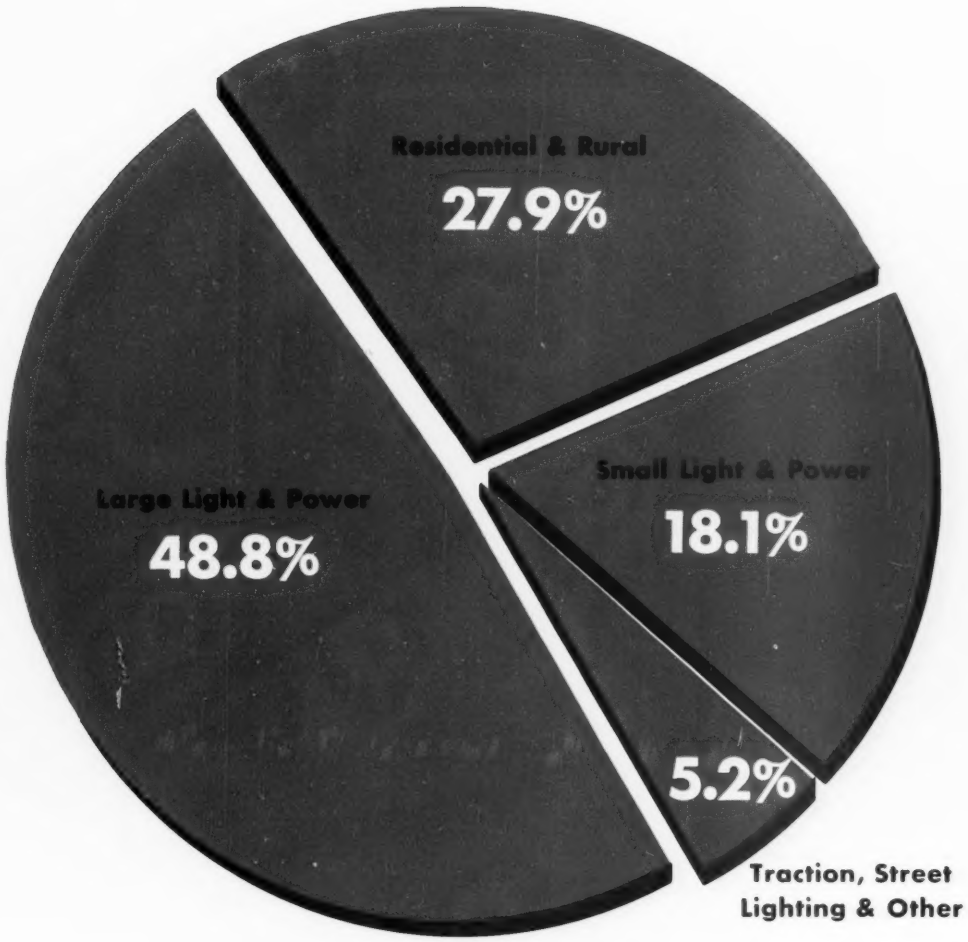
Because more than 97% of all occupied urban and rural homes are being served, future customer additions will largely reflect the formation of new households.

Net increases in customers is shown here to present a truer picture. This data eliminates reclassification—the shift of customers from one class to another.

Net increase in small and large light and power customers, declining for the past several years, has reversed in trend with the net increase in SL&P during the first ten months of 1952 6% ahead of the twelve months of 1951, LL&P 29% ahead.

ENERGY SALES





Proportion of Energy Sales

Industry-wide sales of electric energy rose 7.8% during 1952 to reach a record 343 billion kwhr.

Despite the loss of sales because of the steel strike, sales to large light and power customers increased 6.1%. These were 167 billion kwhrs, 48.8% of the total.

Sales to small light and power customers increased 8.5%—reached 62 billion kwhr. Residential sales showed the largest increase, 13%—totaling 87 billion kwhr.

Sales have nearly doubled in the past six years. At that time sales to residential and rural customers were only 22.5% of the total. Today they are 27.9% of the total.

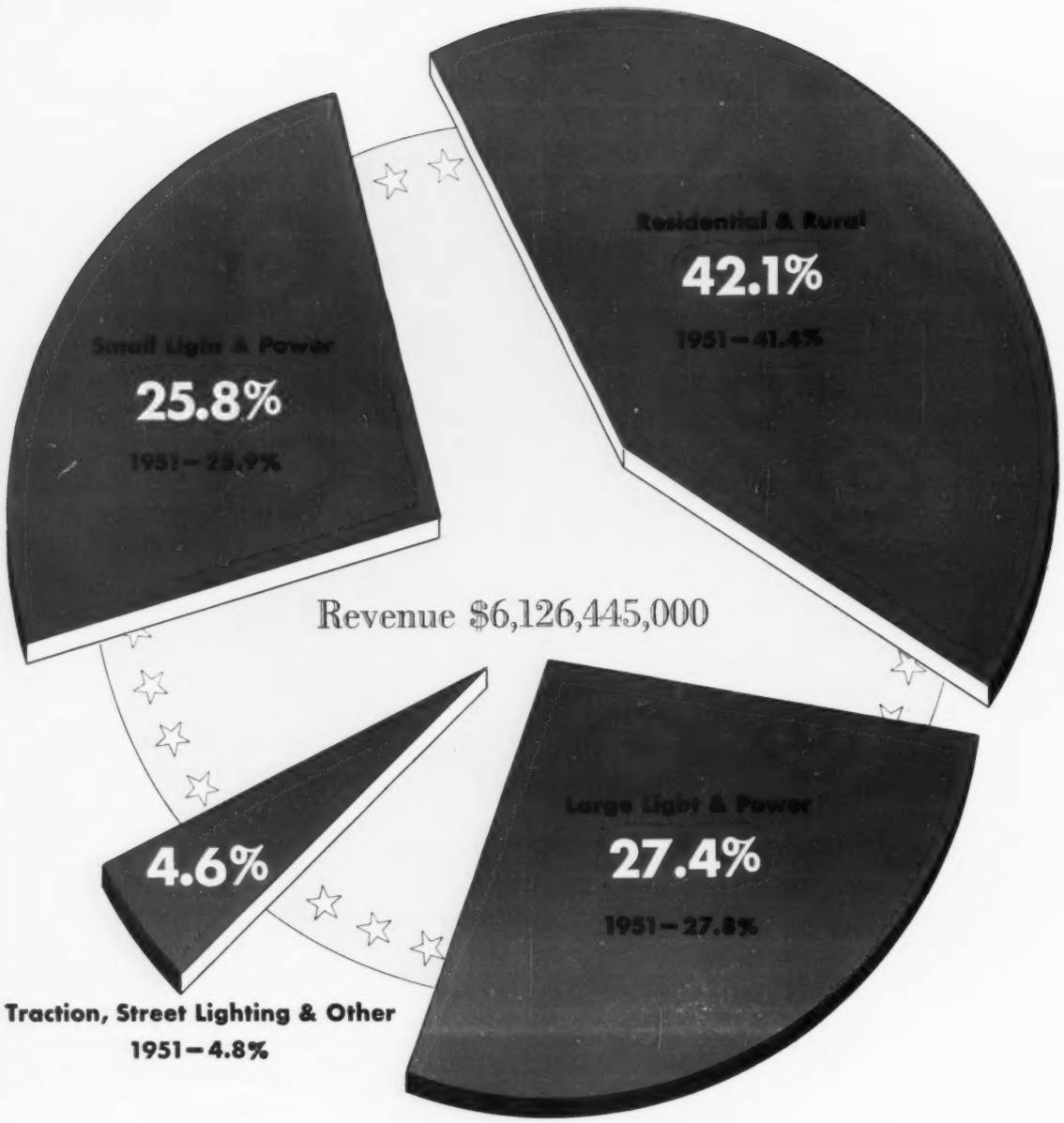
Energy Sales

Millions of Kwhr

	Rural*	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Other Public Authorities	Electric Traction	Interdepartmental	Total
1937..	1,670	17,690	18,075	51,360	1,863	2,403	5,712	586	99,359
1938..	1,577	19,371	19,137	43,140	1,929	2,451	5,438	688	93,731
1939..	1,881	21,084	20,722	51,108	2,002	2,538	5,765	667	105,768
1940..	1,991	23,318	22,373	59,557	2,048	2,720	5,909	727	118,643
1941..	2,352	25,124	24,628	76,060	2,111	3,093	6,078	614	140,060
1942..	2,890	26,937	27,234	88,378	2,061	4,206	6,628	1,074	159,408
1943..	2,996	28,621	28,192	106,657	2,075	9,139	7,226	983	185,889
1944..	3,373	31,266	29,837	115,187	2,163	8,463	7,329	543	198,161
1945..	3,668	34,184	30,438	107,490	2,184	7,589	7,354	650	193,558
1946..	4,431	38,571	33,016	98,885	2,272	5,854	7,147	619	190,794
1947..	5,551	44,171	38,379	113,523	2,365	5,916	7,104	571	217.581
1948..	6,327	50,978	43,193	124,088	2,525	6,255	6,720	654	240,740
1949..	7,384	58,139	46,262	120,766	2,726	6,583	6,112	570	248,542
1950..	7,400	67,030	50,446	139,065	2,976	7,163	5,882	578	280,539
1951..	8,479	77,024	57,278	157,827	3,285	7,987	5,760	527	318,168
1952**	8,519	87,030	62,150	167,450	3,530	8,506	5,402	481	343,068

Source: Edison Electric Institute. * Sales on distinct rural rates. ** Estimated.

REVENUE



Revenue Up 8.5%—Tops $6 Billion

Use of electricity in the American home continues to rise during 1952 with consumption of the average residential customer totalling 2,175 kwhr

Revenue from Electricity Sales

Thousands of Dollars

	Rural*	Residential	Small Light and Power	Large Light and Power	Street and Highway Lighting	Other Public Authorities	Electric Traction	Inter-departmental	Total
1937	37,726	759,824	616,438	583,196	72,740	38,793	47,780	4,299	2,160,798
1938	38,928	802,532	632,091	518,694	74,323	40,195	45,507	4,311	2,156,580
1939	45,484	843,158	660,683	572,659	75,443	40,796	47,000	4,360	2,289,583
1940	49,473	895,951	689,253	631,428	76,052	45,515	47,808	4,737	2,440,218
1941	64,396	938,229	725,117	758,083	76,949	49,203	48,945	4,136	2,665,057
1942	75,027	990,185	767,279	828,318	75,660	60,206	53,632	5,536	2,885,843
1943	76,617	1,029,260	773,678	964,192	75,384	94,958	58,098	5,457	3,077,643
1944	82,842	1,097,726	817,355	1,043,392	76,626	94,452	60,274	4,085	3,276,752
1945	90,344	1,167,356	850,213	1,001,957	76,189	88,854	61,464	5,141	3,341,518
1946	104,876	1,240,577	924,775	969,348	77,570	77,047	60,288	5,078	3,459,560
1947	123,748	1,366,498	1,031,335	1,106,555	78,181	78,319	63,035	5,093	3,852,765
1948	140,648	1,532,663	1,152,783	1,250,684	82,391	84,890	63,551	5,712	4,313,313
1949	160,855	1,716,533	1,228,726	1,262,698	88,087	91,067	60,752	5,351	4,614,069
1950	157,611	1,931,696	1,333,755	1,404,980	94,330	99,696	59,051	5,347	5,086,465
1951	175,431	2,165,010	1,462,262	1,571,932	101,250	110,107	56,896	4,784	5,647,672
1952**	183,970	2,397,500	1,582,000	1,679,000	107,540	117,538	54,397	4,500	6,126,445

Source: Edison Electric Institute. * Distinct rural rates only. ** Estimated.

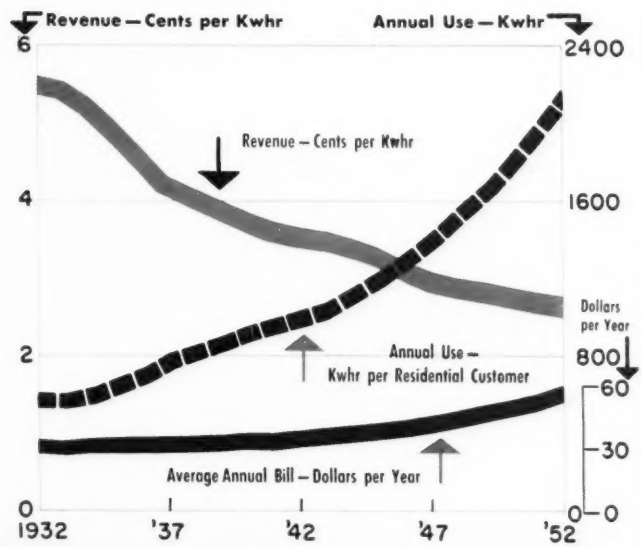
Revenue from industry-wide sales of electricity during 1952 was $6,126 million. This was an 8.5% increase over the $5,648 million revenue received during the year preceding.

The increase of 171 kwhr in annual use by the average residential customer during 1952 and an increase of 1.5 million residential customers were responsible for a 13.0% increase in sales to this class of customer. This increase of 171 kwhr caused a rise in the average bill of $3.54 bringing it to $59.85. As a result of these increases, revenue received from residential customers increased by $233 million, 10.8%.

At the same time the revenue per kwhr received from the average residential customer reached a new low, 2.76¢.

Fully 48.7% of the $478 million increase in revenue was received from sales to residential customers. This class now provides 39.1% of the industry's total revenue.

Revenue received from sales to large light and power customers increased 6.2% while that received from small light and power customers increased 8.2%.

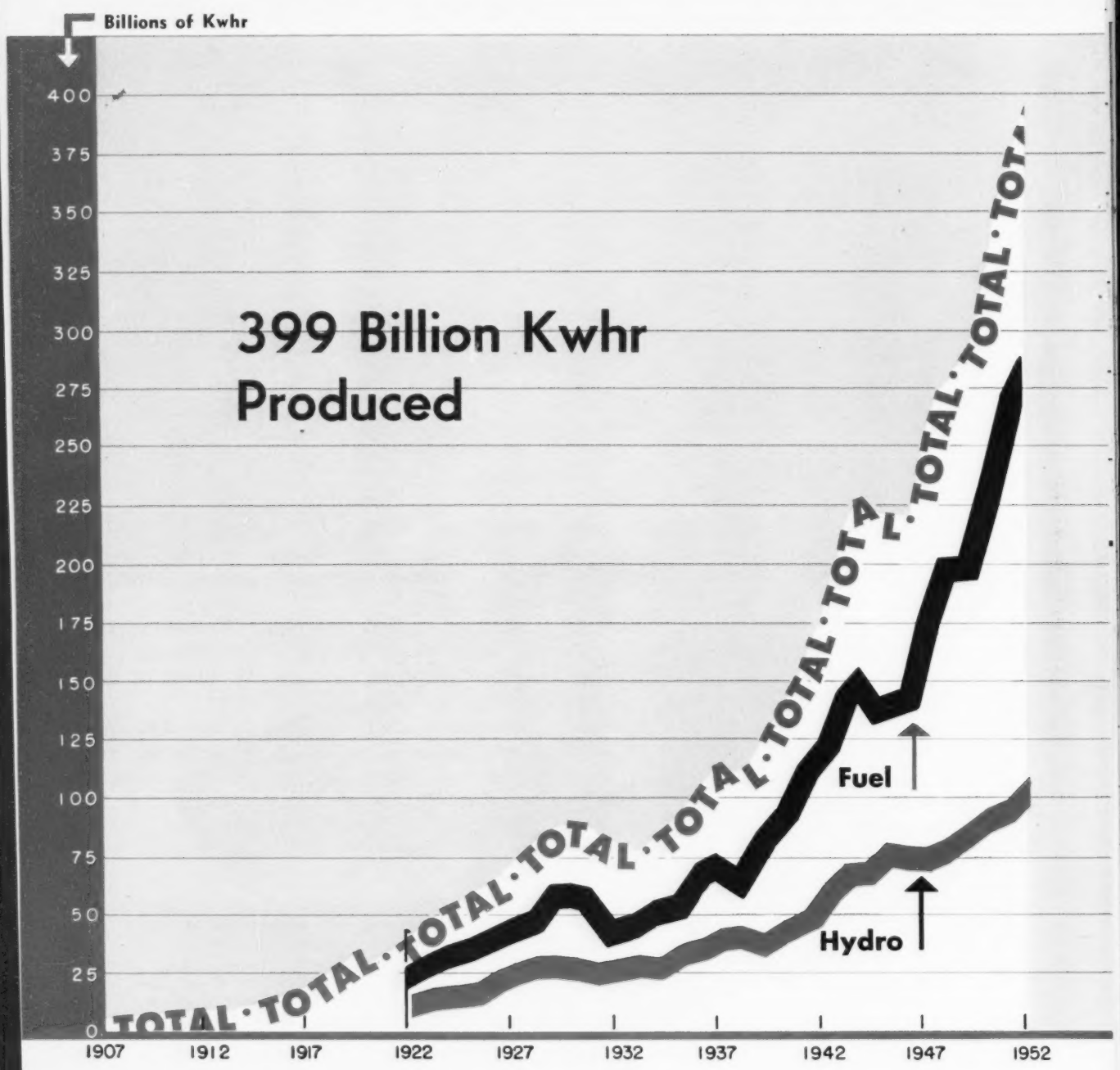


Averages for Residential Service

	Kwhr per Customer	Average Annual Bill Dollars	Revenue per Kwhr Cents
1937	805	34.62	4.30
1938	853	35.31	4.14
1939	897	35.88	4.00
1940	952	36.56	3.84
1941	986	36.78	3.73
1942	1,022	37.51	3.67
1943	1,070	38.52	3.60
1944	1,151	40.40	3.51
1945	1,229	41.97	3.41
1946	1,329	42.79	3.22
1947	1,438	44.43	3.09
1948	1,563	47.05	3.01
1949	1,684	49.68	2.95
1950	1,830	52.70	2.88
1951	2,004	56.31	2.81
1952*	2,175	59.85	2.76

Source: Edison Electric Institute. * Estimated.

PRODUCTION



Rate of increase in production down to 7.7%. Total 399,374 million kwhr

Production of electric energy rose to an estimated 399,374 million kwhr during 1952. The rate of increase in production, nearly 13% in both 1950 and 1951, slowed to 7.7% chiefly because of the steel strike, adverse hydro conditions, a smaller increase in rate of industrial production.

Production of thermal plants rose 8.2% to 293,094 million kwhr. That of hydro plants, 6.5% to 106,280 million kwhr. The proportion of hydro, declining for the past decade, continued the trend by slipping to 26.6%.

Regional rank remained unchanged in 1952 with adverse hydro conditions apparently the chief reason for a one per cent decline in the Pacific's contribution to the national total.

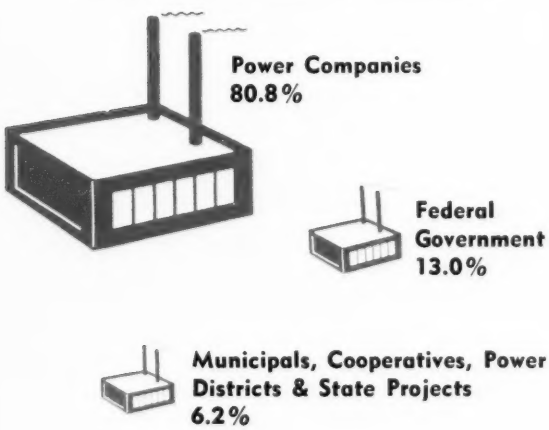
Source and Disposal of Energy

Millions of Kwhr

	Production		Total Production	Add Net Imports	Less Energy Used by Producer	Total for Distribution	Losses	Sales to Ultimate Consumers
	Fuel	Hydro						
1937	74,900	44,013	118,913	1,733	6,428	114,218	14,859	99,359
1938	69,533	44,279	113,812	1,867	6,990	108,689	14,958	93,731
1939	84,078	43,564	127,642	1,900	7,734	121,808	16,040	105,768
1940	94,516	47,321	141,837	937	7,268	135,506	16,863	118,643
1941	113,925	50,863	164,788	927	6,335	159,380	19,320	140,060
1942	122,108	63,871	185,979	1,448	6,611	180,816	21,409	159,407
1943	144,127	73,632	217,759	1,537	9,729	209,567	24,678	185,889
1944	154,244	73,945	228,189	1,597	6,541	223,245	25,084	198,161
1945	142,516	79,970	222,486	1,773	3,368	220,891	27,333	193,558
1946	144,772	78,406	223,178	1,666	4,576	220,268	29,474	190,794
1947	177,314	78,425	255,739	1,269	6,186	250,822	33,241	217,581
1948	200,228	82,470	282,698	1,113	6,368	277,443	36,703	240,740
1949	201,351	89,748	291,099	1,004	5,887	286,216	37,675	248,542
1950	233,203	95,938	329,141	1,283	8,445	321,979	41,440	280,539
1951	270,922	99,751	370,673	1,715	8,969	363,419	45,251	318,168
1952 *	293,094	106,280	399,374	1,930	10,300	391,004	47,200	343,800

Source: Federal Power Commission and Edison Electric Institute. All data revised to correspond with current basis which excludes former Mining and Manufacturing and Railroad and Railway classification. * Estimated.

Energy Production by Ownership



Production of Electric Energy by Ownership

Millions of Kwhr

	Power Companies	Local †	Federal	Total Local and Federal
1937	110,464	6,606	1,843	8,449
1938	104,090	6,693	3,029	9,722
1939	115,078	7,088	5,476	12,564
1940	125,411	7,842	8,584	16,426
1941	144,290	9,705	10,794	20,498
1942	158,052	11,034	16,893	27,928
1943	180,247	13,027	24,484	37,511
1944	185,850	13,473	28,866	42,339
1945	180,926	13,559	28,001	41,560
1946	181,020	15,198	26,960	42,158
1947	208,105	17,757	29,877	47,634
1948	228,231	19,094	35,373	54,467
1949	233,112	19,885	38,102	57,987
1950	266,823	21,877	40,298	62,175
1951	301,845	24,708	44,120	68,828
1952*	322,680	24,636	52,058	76,694

Source: Federal Power Commission.
* Estimated. † Includes municipals, cooperatives, power districts and state projects. 1940 and after excludes production by publicly owned transit systems.

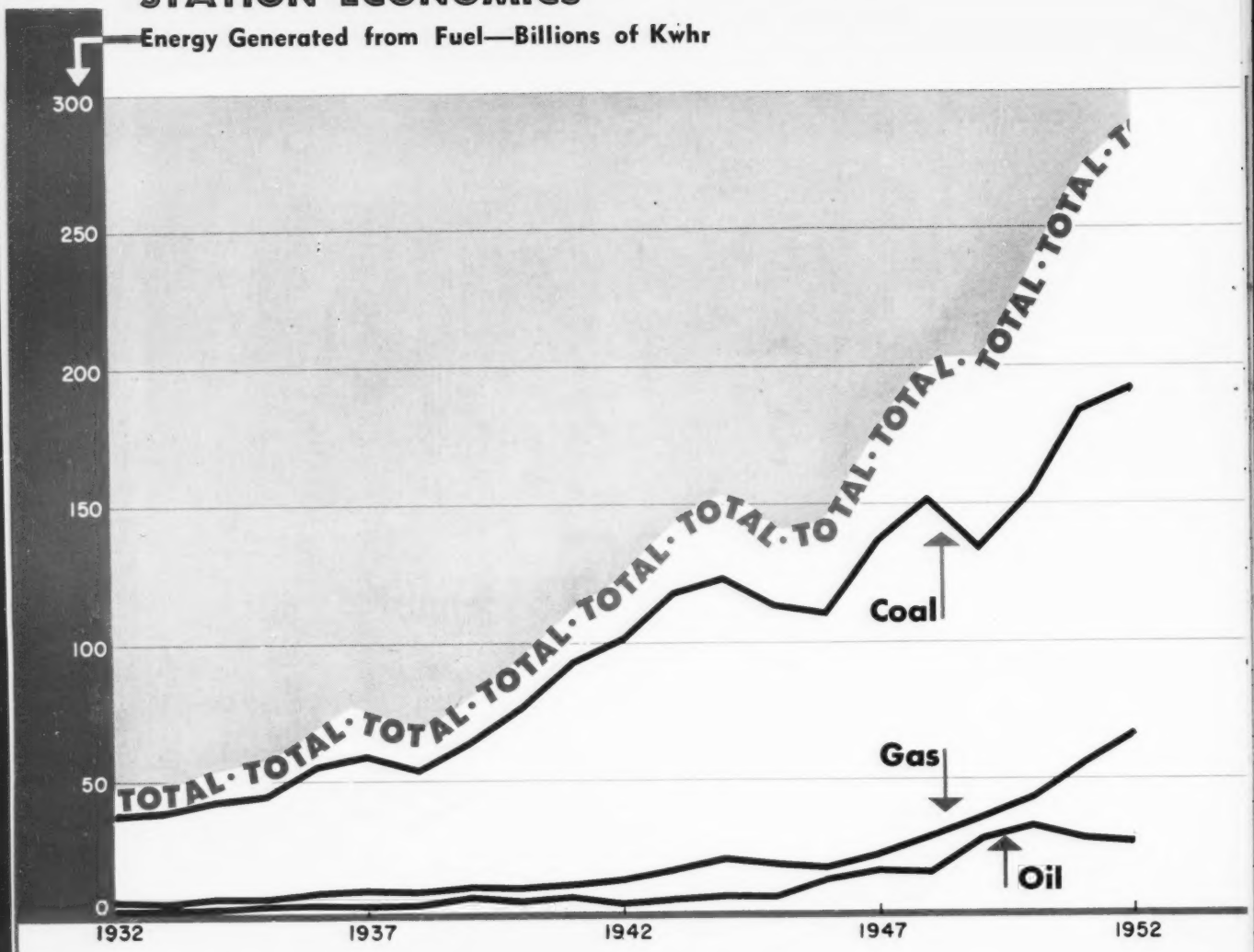
Energy Production by Regions

Millions of Kwhr

	1949			1950			1951			1952*		
	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel	Total	Hydro	Fuel
New England	**14,275**	3,218	11,057	**16,211**	3,676	12,535	**17,490**	4,448	13,042	**18,585**	4,293	14,292
Mid. Atlantic	**56,933**	9,038	47,895	**63,372**	9,988	53,384	**70,027**	9,963	60,064	**73,174**	9,702	63,472
E. N. Central	**66,253**	2,748	63,504	**75,349**	3,363	71,986	**84,391**	4,396	79,995	**88,634**	4,070	84,564
W. N. Central	**17,486**	2,833	14,653	**19,237**	2,877	16,360	**21,170**	3,405	17,766	**22,389**	3,009	19,380
S. Atlantic	**36,973**	11,044	25,929	**43,604**	9,279	34,325	**49,754**	7,529	42,225	**55,424**	9,077	46,347
E. S. Central	**21,824**	16,097	5,727	**24,606**	15,614	8,992	**27,959**	14,903	13,056	**32,177**	14,642	17,535
W. S. Central	**19,429**	1,350	18,080	**22,515**	1,380	21,135	**26,997**	1,341	25,655	**30,742**	1,196	29,546
Mountain	**15,444**	12,012	3,432	**16,497**	12,391	4,106	**17,626**	12,543	5,084	**22,564**	16,936	5,628
Pacific	**42,483**	31,409	11,074	**47,751**	37,371	10,380	**55,258**	41,222	14,036	**55,685**	43,355	12,330
United States	**291,099**	89,748	201,351	**329,141**	95,938	233,203	**370,673**	99,751	270,922	**399,374**	106,280	293,094

Source: Federal Power Commission. * Estimated.

STATION ECONOMICS



Coal Rate Hits Low of 1.10 lb per kwhr

	Energy Generated From Coal, Oil, and Gas				Coal, Oil, and Gas Consumed				Coal Rate
	Coal Billions of Kwhr	Oil Billions of Kwhr	Gas Billions of Kwhr	Total Billions of Kwhr	Coal Millions of Tons	Oil Millions of Bbls	Gas Billions of Cu Ft	Coal and Equivalent of Oil and Gas Millions of Tons	Pounds per Kwhr
1939.....	64.7	7.3	11.6	83.6	44.54	17.14	188.88	57.60	1.38
1940.....	76.8	6.2	10.9	94.0	51.47	16.33	180.10	62.94	1.34
1941.....	93.8	7.5	12.0	113.3	62.67	20.08	201.76	75.70	1.34
1942.....	101.9	5.6	14.1	121.6	66.26	15.24	235.21	79.08	1.30
1943.....	119.2	6.8	17.8	143.8	77.30	17.99	301.94	93.27	1.30
1944.....	124.1	8.1	21.6	153.9	80.08	20.86	358.78	99.25	1.29
1945.....	114.8	7.8	19.7	142.3	74.72	20.23	326.21	92.64	1.30
1946.....	111.7	14.1	18.8	144.6	72.20	36.32	306.94	93.47	1.29
1947.....	137.0	16.9	23.1	177.0	89.53	45.31	373.05	115.67	1.31
1948.....	152.9	16.8	30.1	199.8	99.59	42.64	478.10	130.12	1.30
1949.....	135.5	28.5	37.0	201.0	83.96	66.30	550.12	124.57	1.24
1950.....	154.5	33.7	44.6	232.8	91.87	75.42	628.92	138.42	1.19
1951.....	185.2	28.7	56.6	270.5	105.77	63.94	763.90	154.50	1.14
1952*.....	191.7‡	28.0‡	66.5‡	286.5†	105.77	63.14	886.97	157.95	1.10

Source: Federal Power Commission. * Twelve months ended November 1. † Small amount of energy generated from wood included in 1952. ‡ Preliminary.

Changes in Installed Capacity Kw

	Additions	Retirements
1941.....	2,624,075	170,401
1942.....	2,871,342	232,170
1943.....	3,026,065	93,751
1944.....	1,452,676	197,242
1945.....	978,265	202,427
1946.....	394,575	206,363
1947.....	2,146,658	174,865
1948.....	4,183,318	125,005
1949.....	6,611,387	214,050
1950.....	5,803,392	163,230
1951.....	6,968,257	218,513
1952*.....	3,965,956	139,440

* Data to November 1. Mining and Manufacturing capacity omitted after 1943. Railroad and Railways capacity omitted after 1944. Retirements for 1945 and 1946 include one 75,000 kw unit for each year. Additions for 1948 include these two units.

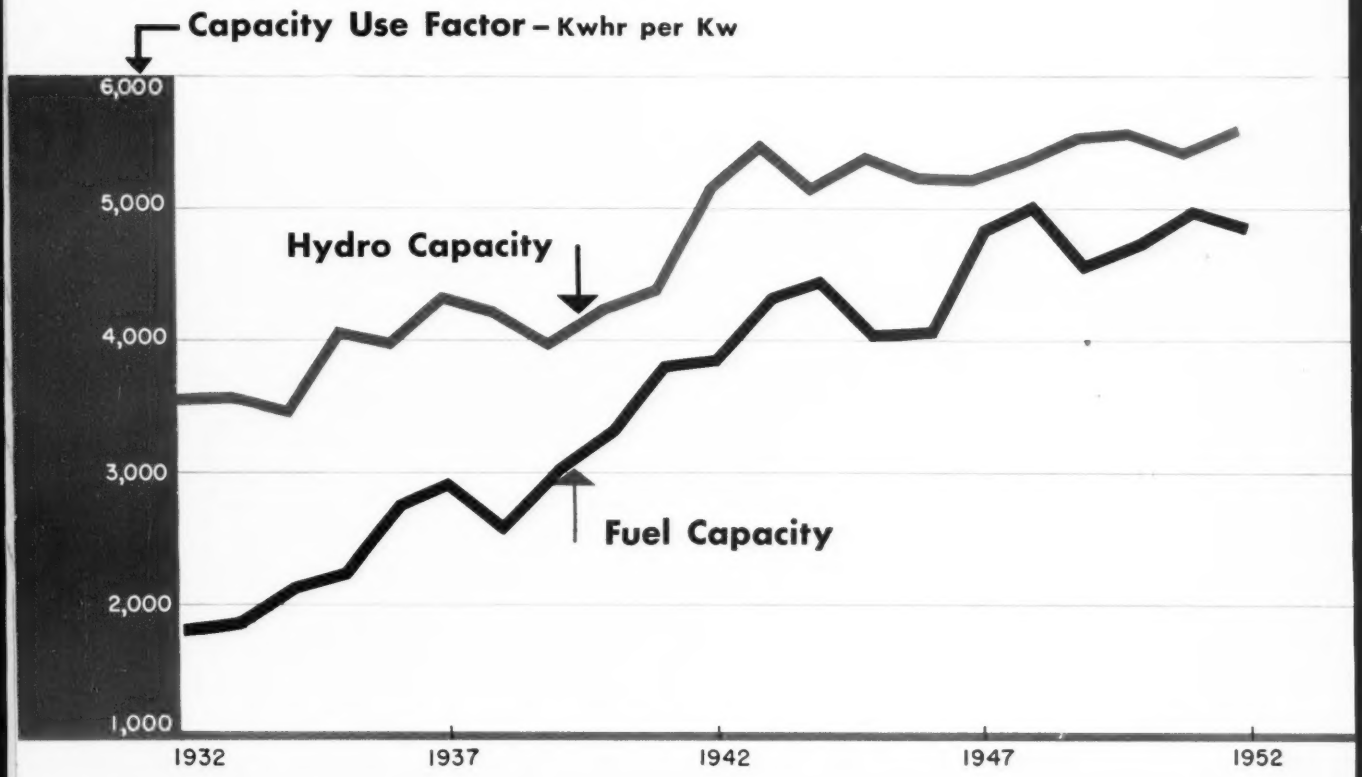
Production, Capacity, Average Use

	Production Millions of Kwhr			Year End Capacity Thousands of Kw			Kwhr per Kw of Average Capacity		
	Fuel	Hydro	Total	Fuel	Hydro	Total	Fuel	Hydro	Total
1937	74,900	44,013	**118,913**	25,444	10,176	**35,620**	2,967	4,355	**3,364**
1938	69,533	44,279	**113,812**	26,835	10,657	**37,492**	2,661	4,251	**3,113**
1939	84,078	43,564	**127,642**	27,859	11,004	**38,863**	3,074	4,022	**3,343**
1940	94,516	47,321	**141,837**	28,703	11,224	**39,927**	3,342	4,258	**3,600**
1941	113,925	50,863	**164,788**	30,588	11,817	**42,405**	3,843	4,415	**4,003**
1942	122,109	63,871	**185,979**	32,211	12,842	**45,053**	3,889	5,180	**4,253**
1943	144,127	73,632	**217,759**	34,067	13,884	**47,951**	4,349	5,510	**4,683**
1944	154,244	73,945	**228,189**	34,603	14,586	**49,189**	4,492	5,195	**4,698**
1945	142,516	79,970	**222,486**	35,199	14,912	**50,111**	4,078	5,422	**4,481**
1946	144,772	78,406	**223,178**	35,468	14,849	**50,317**	4,097	5,269	**4,445**
1947	177,313	78,426	**255,739**	37,351	14,971	**52,322**	4,870	5,260	**4,983**
1948	200,228	82,470	**282,698**	40,908	15,652	**56,560**	5,052	5,386	**5,193**
1949	201,351	89,748	**291,099**	46,446	16,654	**63,100**	4,610	5,561	**4,865**
1950	233,203	95,938	**329,141**	51,244	17,675	**68,919**	4,774	5,589	**4,986**
1951	270,922	99,751	**370,673**	56,907	18,868	**75,775**	5,010	5,460	**5,123**
1952*	293,094	106,280	**399,374**	61,775	20,200	**81,975**	4,939	5,442	**5,063**

Source: Federal Power Commission and Edison Electric Institute. *1952 data estimated. 1945 and after excludes former Mining and Manufacturing and Railroad and Railway classifications.

Coal rate has hit a new low. It now requires an average of only 1.10 lb of coal or its equivalent to produce a kwhr. As a result of the continued decrease in coal rate the average unit consumption of fuel for the production of electricity is now 15% lower than it was a decade ago when coal rate stood at 1.30.

The use of gas for the production of electric energy increased 18.5% during the year ending October 31, 1952. A record 887 billion cubic feet were consumed during this period. At the same time energy produced from coal, oil and gas increased 7.8%.

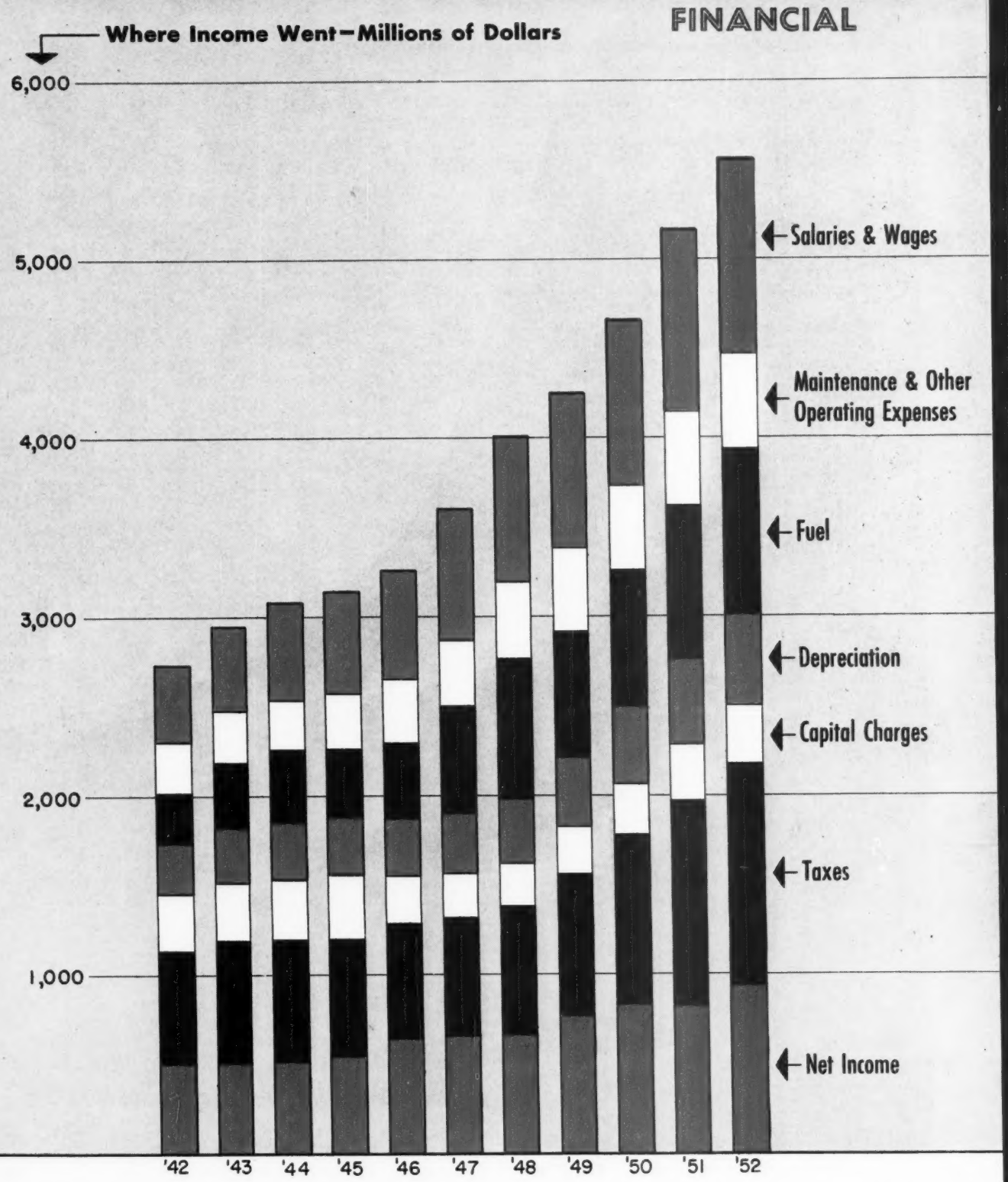


Analysis of Fuel Burned Under Boilers and by Internal Combustion Engines

		Average Btu per Net Kwh	Average Cost per Million Btu Consumed ¢	Average Cost of Fuel per Net Kwh ¢	% Net Generation Reported	Average Cost per Million Btu Consumed—Cents			Coal(a)		Oil(b)		Gas(c)	
						Coal(a)	Oil(b)	Gas(c)	Average Cost per Ton $ per Ton	Average Btu Content Btu per Pound	Average Cost per bbl. $ per bbl.	Average Btu Content Btu per Gallon	Average Cost Per M Cu. Ft. $ per M Cu. Ft.	Average Btu Content Btu per Cu. Ft.
United States	1951	13,641	24.8	.34	94.3	26.8	33.5	13.9	6.42	11,968	2.11	150,137	.135	972
	1950	14,030	24.8	.35	93.6	26.9	31.8	12.3	6.38	11,839	2.00	149,699	.118	960
	1949	15,033	25.2	.38	91.8	27.1	34.2	11.8	6.50	12,011	2.15	149,843	.123	1,046
	1948	15,738	26.7	.42	82.3	27.9	45.3	10.5	6.69	11,980	2.81	147,653	.110	1,053
New England	1951	13,970	35.8	.50	95.6	36.0(e)	35.5	——	9.93(e)	13,775	2.24	150,227	——	——
	1950	14,473	34.3	.50	95.7	36.0(e)	32.9	——	9.89(e)	13,728	2.08	150,486	——	——
	1949	15,422	36.1	.56	96.5	39.4	32.6	——	10.87	13,784	2.07	150,984	——	——
	1948	17,792	38.6	.69	87.2	36.7	47.1	——	10.68	14,537	2.95	149,008	——	——
Middle Atlantic	1951	13,964	29.0	.40	98.7	28.3	35.9	26.3	7.20	12,739	2.26	149,962	.274	1,052
	1950	14,315	28.5	.41	98.3	27.4	32.3	26.0	6.90	12,604	2.03	149,790	.258	991
	1949	14,950	28.5	.43	98.0	28.2	30.4	19.9	7.19	12,768	1.92	150,345	.188	945
	1948	15,556	29.8	.46	97.0	28.3	52.5	37.0	7.21	12,727	3.32	150,596	.400	1,080
East North Central	1951	13,123	25.6	.34	95.4	25.7	72.6	20.2	5.90	11,484	4.40	144,445	.121	601
	1950	13,462	26.4	.36	95.3	26.4	59.0	18.2	6.03	11,415	3.58	144,564	.108	594
	1949	14,329	24.9	.36	89.7	25.0	47.0	16.3	5.81	11,619	2.85	144,416	.160	984
	1948	14,337	26.9	.39	74.9	26.7	73.9	16.8	6.16	11,544	4.52	145,700	.155	924
West North Central	1951	16,201	24.4	.40	71.4	28.4	52.2	17.3	5.61	9,888	3.21	146,478	.134	774
	1950	16,659	24.0	.40	70.3	29.1	51.8	15.0	5.77	9,908	3.14	144,399	.117	782
	1949	18,441	27.7	.51	72.0	28.0	70.0	15.4	5.69	10,167	4.21	143,277	.155	1,005
	1948	18,610	25.6	.48	64.7	27.7	60.2	13.1	5.69	10,274	3.61	142,844	.133	1,012
South Atlantic	1951	12,978	26.8	.35	96.5	26.7	33.7	18.3	6.86	12,862	2.12	149,815	.188	1,023
	1950	13,295	26.4	.35	95.7	26.5	31.2	15.2	6.76	12,747	1.96	149,779	.155	1,023
	1949	13,640	27.4	.37	96.3	27.8	31.4	15.2	7.17	12,882	1.98	150,214	.156	1,023
	1948	14,636	29.7	.44	74.4	27.2	46.6	15.3	6.99	12,861	2.92	149,305	.157	1,025
East South Central	1951	13,560	18.3	.25	96.8	20.2	44.0	13.9	4.78	11,856	2.75	148,815	.144	1,035
	1950	13,472	19.1	.26	95.6	21.7	43.0	13.8	5.10	11,771	2.69	148,814	.141	1,025
	1949	13,736	25.0	.34	90.4	23.5	74.7	13.3	5.56	11,839	4.39	140,000	.138	1,036
	1948	15,202	23.1	.35	92.7	24.4	84.1	12.0	5.74	11,758	4.87	137,887	.127	1,058
West South Central	1951	14,017	8.2	.11	91.9	19.6	40.9	8.0	4.51	11,496	2.54	147,771	.084	1,057
	1950	14,649	7.7	.11	89.0	18.7	25.0	7.5	4.49	12,024	1.55	147,662	.080	1,063
	1949	16,833	7.9	.13	91.7	19.3	32.2	7.6	4.60	11,892	1.99	146,956	.081	1,068
	1948	18,129	7.4	.14	80.8	20.0	51.2	6.5	4.82	12,039	3.03	140,769	.070	1,069
Mountain	1951	15,063	18.8	.28	87.6	22.7	38.0	16.4	4.67	10,274	2.35	147,628	.159	969
	1950	16,013	18.1	.29	85.9	22.6	42.8	15.7	4.63	10,246	2.63	146,143	.152	967
	1949	17,584	19.3	.34	75.6	23.1	51.3	15.2	4.89	10,592	3.15	146,269	.150	986
	1948	17,344	21.4	.37	66.1	23.9	57.6	15.2	5.04	10,530	3.56	147,096	.148	975
Pacific	1951	13,385	23.4	.31	96.1	11.3	26.7	20.8	0.70	3,114	1.69	151,047	.226	1,089
	1950	13,920	19.9	.28	96.2	10.7(d)	21.5	19.6	0.70(d)	3,259(d)	1.35	149,799	.213	1,084
	1949	16,080	25.0	.40	93.0	14.1(d)	29.8	19.7	1.08(d)	3,818(d)	1.88	150,010	.212	1,077
	1948	17,158	28.2	.48	96.9	13.5(d)	36.1	19.8	1.04(d)	3,862(d)	2.23	147,142	.213	1,075

Source: Edison Electric Institute

(a) Coal includes bituminous and anthracite coal, and relatively small amounts of coke, lignite and wood.
(b) Oil includes fuel oil, crude oil, and small amounts of tar and gasoline.
(c) Gas includes natural and manufactured gas and waste gas.
(d) Cords and cubic feet of hogged wood converted to pounds and tons.
(e) Includes bbl. of oil converted to equivalent tons of coal.



Net Income Hits Record High in 1952

Operating revenues of the electric companies hit another new top in 1952—totaling $5.4 billion as shown in preliminary figures on page 164. This enabled net income to go $934 million, a record high. Utility plant amounted to over $25 billion at the end of 1952. To take care of

Power Companies Composite Income Statement

Millions of Dollars

	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952*
Total Electric Revenue	2,609	2,816	2,955	3,012	3,127	3,480	3,886	4,113	4,510	5,004	5,400
Operating Expenses	1,002	1,127	1,225	1,259	1,385	1,701	2,019	2,030	2,158	2,397	2,550
Depreciation	291	307	319	322	324	339	364	389	438	476	511
Total Expenses	1,293	1,434	1,544	1,581	1,709	2,040	2,383	2,419	2,596	2,873	3,061
Electric Operating Income before Taxes	1,316	1,382	1,411	1,431	1,418	1,440	1,503	1,694	1,914	2,131	2,339
Taxes	628	680	677	652	644	664	712	794	948	1,150	1,240
Electric Operating Income after Taxes	688	702	734	779	774	776	791	900	966	981	1,099
Other Income [1]	128	132	125	126	130	125	118	132	147	152	160
Gross Corporate Income	816	834	859	905	904	901	909	1,032	1,113	1,133	1,259
Capital Charges [2]	317	322	342	360	258	245	243	267	282	311	325
Net Income	499	512	517	545	646	656	666	765	831	822	934
Dividends	451	418	406	415	466	500	499	566	626	658	718
Surplus	48	94	111	130	180	156	167	199	205	164	216

Source: Federal Power Commission & Edison Electric Institute. * Estimated. [1] Includes revenues of gas, water, and steam departments and interest on securities held. [2] Includes amortization and interest on long term debt.

Distribution of Revenue Dollar

Percent

	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952*
Fuel	10.3	12.3	13.1	12.2	13.1	16.6	19.4	16.6	16.3	16.7	16.3
Salaries and Wages	16.0	16.0	17.5	18.0	18.5	20.6	20.4	20.3	19.9	19.9	19.6
Maintenance and Other Operating Expenses	10.4	9.9	9.1	9.8	11.0	10.0	10.6	10.9	10.1	10.0	10.0
Depreciation	10.6	10.4	10.4	10.3	9.9	9.4	9.1	9.2	9.4	9.2	9.2
Fixed Charges	11.6	10.9	11.1	11.5	7.9	6.8	6.1	6.3	6.1	6.0	5.8
Taxes	22.9	23.1	22.0	20.8	19.8	18.4	17.8	18.7	20.4	22.3	22.3
Dividends and Surplus	18.2	17.4	16.8	17.4	19.8	18.2	16.6	18.0	17.8	15.9	16.8
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Federal Power Commission and Edison Electric Institute. * Estimated.

Security Sales by Electric Light and Power Companies

Thousands of Dollars

	Bonds, Debentures, etc.		Stocks, Common and Preferred	Total Financing	Distribution of Security Sales		
	Public Investors	Institutional Investors			New Capital	Refunding	Total Issues
1937	522,613	37,604	86,095	646,312	81,984	563,699	645,682
1938	750,549	192,762	20,694	964,005	123,056	840,949	964,005
1939	620,205	252,625	123,517	996,347	16,219	980,128	996,347
1940	660,716	188,976	139,767	989,459	92,376	897,083	989,459
1941	368,712	255,912	116,208	740,832	97,065	643,767	740,832
1942	226,800	99,688	29,766	356,254	92,666	263,588	356,254
1943	329,300	26,850	14,912	371,062	9,921	361,141	371,062
1944	851,743	103,950	62,535	1,018,228	15,587	1,002,641	1,018,228
1945	1,113,603	121,051	127,268	1,361,922	39,699	1,322,253	1,361,922
1946	633,966	64,040	384,441	1,082,447	172,846	909,601	1,082,447
1947	1,039,517	153,159	384,699	1,577,375	567,729	1,009,646	1,577,375
1948	996,641	156,525	297,460	1,450,626	1,314,456	136,170	1,450,626
1949	959,978	192,280	640,953	1,793,211	1,444,826	348,385	1,793,211
1950	838,108	278,389	591,340	1,707,837	1,300,040	407,797	1,707,837
1951	778,308	110,696	552,943	1,441,947	1,432,257	9,690	1,441,947
1952	929,167	145,860	630,652	1,705,679	1,693,514	12,165	1,705,679

Source: Irving Trust Co.

part of the large expansion program underway, security sales jumped to $1.7 billion, almost topping 1950, the second largest year on record. Yields on all quality bonds held their own in 1952 while preferred stock yields went down fractionally. Common stock yields showed the greatest changes over the year.

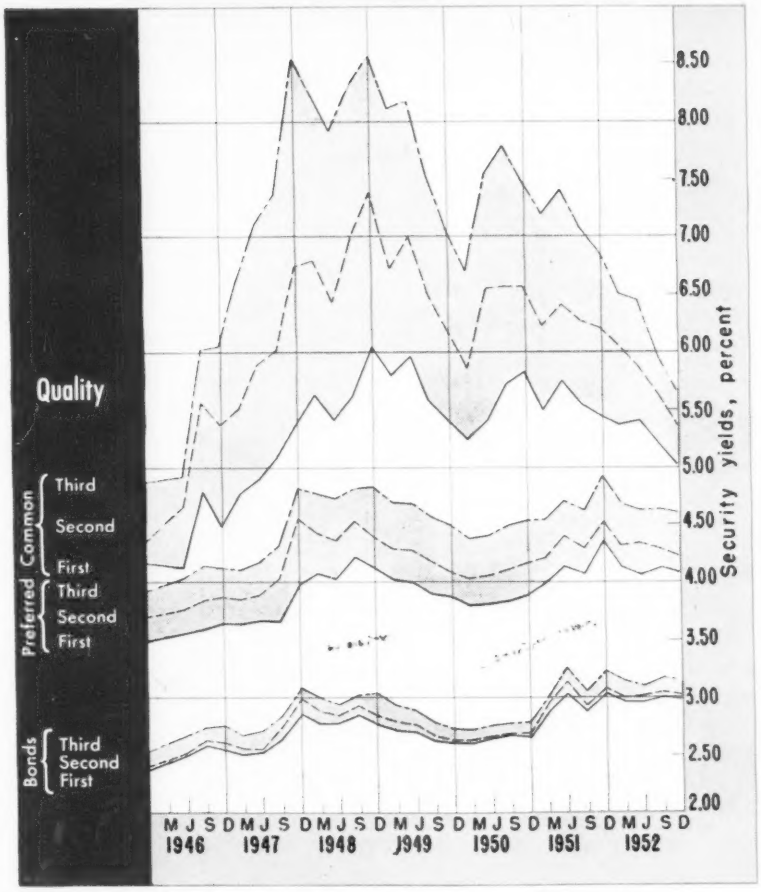
Revenues Higher . . . Total electric operating revenues amounted to $5.4 billion in 1952, an increase of 7.9% over the former high established in 1951. All major classifications shared in the increase with the largest being in residential which was up 10.8% and followed closely by small light and power sales which increased 8.2%.

Expenses Up . . . Operating expenses totaled $2,550 million, a record high, and up 6.4% over 1951. With fuel kwhr generation being up 8.2%, fuel costs showed the largest increase in these expenses. Salaries and wages continued to be the second largest expense in the income statement and increased 7% over 1951. For every dollar of revenue received in 1952, fuel took 16.3¢ and salaries and wages 19.6¢, making a total of 35.9¢ for these two expenses alone.

Depreciation on Uptrend . . . With the utility plant increasing about 9.3% in 1952, depreciation charges went up to a record $511 million or 7.4% over the previous year.

Taxes Also Up . . . This account remains as the largest expense in the statement of income. For 1952 it totaled $1,240 million, an increase of 7.8% over the previous year. The final figure may go off slightly due to the presence of accelerated amortization which will have some effect in the last three

YIELDS—Operating Electric Utilities



Yields on Electric Utility Operating Company Securities

End of	Bonds			Preferred Stocks			Common Stocks		
	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality	First Quality	Second Quality	Third Quality
1946									
March	2.43%	2.44%	2.61%	3.51%	3.71%	3.96%	4.13%	4.49%	4.88%
June	2.50	2.51	2.67	3.55	3.75	4.02	4.11	4.63	4.91
Sept.	2.59	2.62	2.74	3.58	3.83	4.12	4.76	5.54	6.00
Dec.	2.55	2.61	2.75	3.63	3.85	4.10	4.47	5.34	6.03
1947									
March	2.51	2.55	2.67	3.62	3.83	4.09	4.75	5.48	6.59
June	2.52	2.55	2.71	3.65	3.87	4.15	4.87	5.86	7.07
Sept.	2.63	2.73	2.83	3.64	4.01	4.30	5.07	5.99	7.33
Dec.	2.85	2.98	3.07	3.95	4.52	4.80	5.36	6.71	8.50
1948									
March	2.77	2.87	2.99	4.05	4.40	4.74	5.60	6.76	8.19
June	2.77	2.84	2.94	4.01	4.34	4.71	5.39	6.39	7.88
Sept.	2.83	2.92	3.01	4.19	4.51	4.79	5.60	6.97	8.27
Dec.	2.76	2.83	3.03	4.10	4.37	4.81	6.01	7.34	8.53
1949									
March	2.70	2.78	2.92	4.00	4.27	4.67	5.78	6.69	8.08
June	2.69	2.75	2.88	3.98	4.26	4.66	5.94	6.96	8.14
Sept.	2.61	2.65	2.77	3.88	4.15	4.54	5.55	6.47	7.51
Dec.	2.59	2.61	2.72	3.85	4.06	4.46	5.37	6.15	7.01
1950									
March	2.59	2.61	2.71	3.78	4.01	4.36	5.22	5.85	6.67
June	2.63	2.66	2.74	3.79	4.03	4.38	5.38	6.51	7.50
Sept.	2.66	2.67	2.76	3.81	4.08	4.46	5.70	6.54	7.75
Dec.	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44
1951									
March	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.16
June	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.37
Sept.	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
Dec.	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
1952									
March	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
June	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
Sept.	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
Dec.	2.99	3.03	3.14	4.06	4.22	4.59	4.98	5.33	5.62

Source: Reis & Chandler, Inc.

Composite Year End Balance Sheet

Class A & B Electric Utility Companies

	Millions of Dollars			
	1952*	1951	1950	1942
Assets				
Electric Plant and Adjustments	22,750	20,622	18,806	11,547
Other Utility Plant and Adjustments	2,700	2,595	2,451	1,795
Unclassified and Undistributed	100	155	185	1,506
Total Utility Plant	25,550	23,372	21,442	14,848
Reserves for Depreciation and Amortization of Utility Plant	5,100	4,734	4,384	2,306
Total Utility Plant Less Reserves	20,450	18,638	17,058	12,542
Investment and Fund Accounts	1,250	1,235	1,235	1,320
Current and Accrued Assets	2,750	2,308	2,058	1,365
Deferred Debits	180	184	172	385
Capital Stock Discount and Expenses	50	46	41	36
Reacquired Securities	30	27	26	56
Total Assets	**24,710**	**22,438**	**20,590**	**15,704**
Liabilities				
Capital Stock				
Preferred	2,950	2,731	2,575	2,135
Common	5,800	5,409	5,046	4,352
Premium on Capital Stock	450	399	323	110
Total Capital Stock	9,200	8,539	7,944	6,597
Long Term Debt				
Bonds	10,450	9,367	8,637	6,360
Other	750	627	552	394
Total Long Term Debt	11,200	9,994	9,189	6,754
Current and Accrued Liabilities	2,020	1,857	1,527	908
Reserves (except those deducted above)	80	81	86	248
Deferred Credits	140	126	109	87
Contributions in Aid of Construction	80	70	66	50
Surplus				
Earned	1,660	1,445	1,346	863
Capital	330	326	323	197
Total Surplus	1,990	1,771	1,669	1,060
Total Liabilities	**24,710**	**22,438**	**20,590**	**15,704**
Balance Sheet Ratios				
Reserve for Depreciation Percent of Utility Plant	20.0	20.3	20.5	15.5
Current Assets Times Current Liabilities	1.36	1.24	1.35	1.50
Long Term Debt				
Percent of Gross Utility Plant	43.9	42.8	42.9	45.5
Percent of Net Utility Plant	54.8	53.6	53.9	53.8

Source: Federal Power Commission. * 1952 estimated by "Electrical World".

months of 1952. At present it represents 22.3¢ of every revenue dollar received.

Gross Income at Record High . . . Gross income went into new high ground, totaling $1,259 million, an increase of $126 million, or 11.1% over 1951. Other income, including income from other departments and interest on dividends and inter-company dividends, amounted to $160 million as against $152 million the year previous.

Capital Charges Higher . . . This account hit $325 million for 1952 as compared with $311 million in 1951. This increase was principally in interest on funded debt as the industry sold a record $1,075 million in bonds of which $929 million was sold publicly and $145 million was placed privately to institutions.

Net Income at Record . . . Net income hit a record of $934 million in 1952 as against $822 million in 1951 when it was the lowest for any year since 1942.

Dividends Up . . . Total preferred and common stock dividends amounted to $718 million, an increase of 9.1% over 1951. Preferred dividends totaled $130 million and largely increased because the industry in 1952 issued $207.1 million in new preferred. Common dividends jumped to $588 million due to the companies selling $423.6 million in common stock and a number of companies raising their dividend rates or paying extras.

Balance to Surplus Increased . . . Despite record high increases in operating and other costs of doing business, the industry was able to bring into its surplus $216 million in 1952 as against $164 million in 1951, an increase of 31.7%. This has been the largest balance ever brought into surplus in the history of the electric utility industry.

Utility Plant Higher . . . It has been estimated on this page that total assets at Dec. 31, 1952 will amount to over $24.7 billion. Total utility plant will total a little over $25 billion, an increase of $2.2 billion over 1951. After reserves for depreciation and amortization it will amount to about $20.5 billion as against $18.6 billion in 1951. Total earned surplus will go to $1.66 billion as compared with $1.45 billion of total earned surplus the year previous.

Security Sales Up . . . Security financing amounted to $1,705 million in 1952, 18.3% over the previous year. Of this amount $1,693 million was "new money" and exceeded the previous high of $1,444 million sold in 1949.

Yields Mixed . . . Bond yields of all qualities remained quiet in 1952. They ranged from 2.95% for the first quality to 3.16% for the third quality. Preferred stock yields were down slightly in 1952. Common stocks showed the greatest variations as shown in the table on page 165.

Electric Rate Increases–1952

	Granted			Pending		
	Total Number of Grants	Known Dollar Increases		Total Number Applications	Known Dollars Pending	
		Number Grants	Dollars		Number Applications	Dollars
New England	8	8	4,136,000	2	2	1,046,000
Middle Atlantic	10	9	17,899,000	4	2	3,260,000
East North Central	7	7	4,838,800	7	5	3,073,700
West North Central	13	8	5,022,000	1	1	1,000,000
South Atlantic	9	9	6,910,000	5	3	5,749,600
East South Central	1	....	.....	1	....	.....
West South Central	5	3	2,964,000	3	1	85,000
Mountain	8	7	3,219,000	2	....	.....
Pacific	11	5	31,753,000	4	4	17,169,000
Total	**72**	**56**	**76,741,800**	**29**	**18**	**31,383,300**

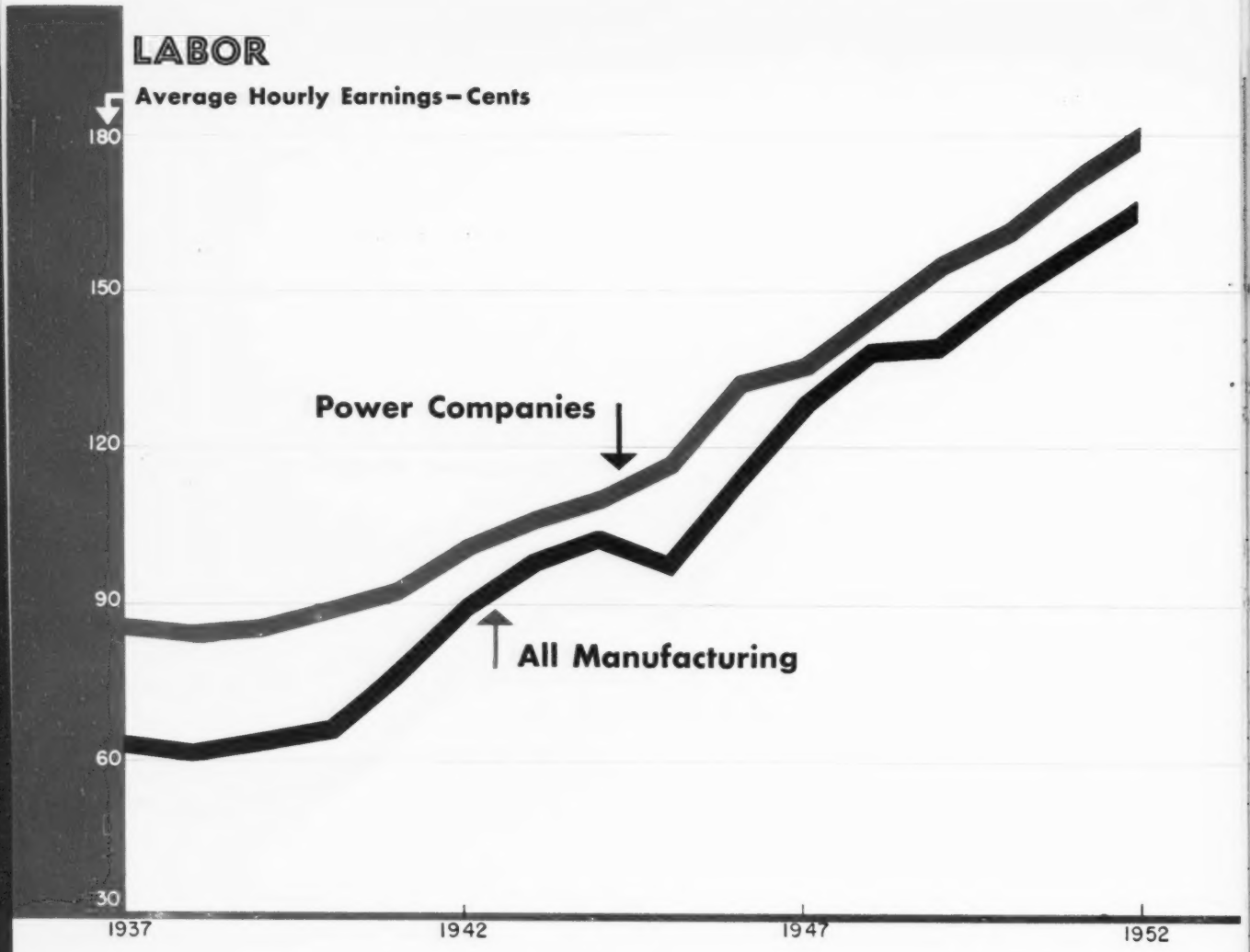
Rate Increases Again on the Upturn

To offset higher costs, electric companies in the United States were granted 72 rate increases in 1952. This exceeded the number granted for the two years of 1950 and 1951. Of the 72 granted, there were 56 with a known dollar increase of over $76.7 million as shown by the above figures.

The area which shows the largest increase granted is the Pacific Coast area where the Pacific Gas & Electric Co received $30.6 million a year boost.

Electric Rate Increases

	Granted			As of December 31	Pending		
	Number of Grants	Known Dollar Increases			Number of Applications	Known Dollars Pending	
		Number of Grants	Dollars			Number of Applications	Dollars
1948	81	45	39,000,000	1948	18	11	22,000,000
1949	74	44	35,000,000	1949	7	5	16,000,000
1950	19	10	14,000,000	1950	21	14	20,200,000
1951	44	27	32,900,000	1951	44	32	75,700,000
1952	72	56	76,741,800	1952	29	18	31,383,300



Wages, Employment Set Record

Wages and Hours Worked by Electric Utility Employees

	Average Hourly Earnings (Cents)	Average Weekly Earnings (Dollars)	Average Weekly Hours	Estimated Number of Employees* (Thousands)
1947.....	137.1	57.44	41.9	213.0
1948.....	146.9	61.70	42.0	226.4
1949.....	156.4	64.91	41.5	233.5
1950.....	163.0	67.81	41.6	234.0
1951.....	173.6	72.74	41.9	234.3
1952‡.....	181.9	75.18	41.3	237.6

Source: Bureau of Labor Statistics. * Covers employees in the electrical divisions of power companies only. ‡ Averages of monthly data for first ten months.

Salaries and wages in the electric industry in 1952 continued their uptrend although average weekly hours were off to 41.3 as compared with 41.9 in 1951. The industry had a record 237,600 employees on the payroll during 1952, Bureau of Labor Statistics has estimated.

Hourly Earnings Up . . . In 1952 average hourly earnings hit another top of nearly $1.82 as shown in the statement on the left. This is an increase of 8.3¢ an hour over the previous year.

Bureau of Labor Statistics has reported that the average hourly earnings for the electric industry for October, latest available, amounted to $1.883 as compared with $1.756 in 1951. This is up 12.7¢,

or 7.2% over 1951. On the other hand, workers in the manufacturing industry had average hourly earnings for October of $1.705 as compared with $1.615 in 1951. This is an increase of only 9.0¢ an hour, or 5.6%.

Since 1947 the average hourly earnings for the electric industry have gone from $1.37 to $1.82, up 45¢, or 32.8% while those of the manufacturing industry went from $1.24 to $1.67, an increase of 43¢, or 34.7%.

Work Hours Shortened . . . The average weekly hours worked by electric employees were off to 41.3 as compared with 41.9 in 1951. This is the least number of hours worked since 1942 when they were on the job 40.8 hours.

Number of Employees Up . . . The electrical divisions of privately owned power companies employed a total of 237,600 employees in 1952, an increase of 3,300 over the previous high of 1951.

Labor Contracts and Terms—1952

Company	Union	Date	Workers Covered	Wage Increase, Other Benefits
Alabama Power	IBEW	3/ 1/52	3,025	10% (WSB)
Arkansas Power & Light	IBEW	5/ 1/52	2,350	$8–$20 per mo., 3 wks va./15 yrs
Appalachian Electric Power	IBEW	4/ 1/52	4,000	3.3%, 3 wks. va./ 15 (20 yrs)
Birmingham Electric	IBEW	3/ 1/52	.....	10% (WSB)
Boston Edison	UWU	1/ 1/52	3,000	9% (9¢–22½¢)
California Electric Power	IBEW	6/ 1/52	500	4½%
Central Hudson Gas & Electric	IBEW	7/ 1/52	550	7%, Jointly pd health & welfare plan
Central Illinois Electric & Gas	IBEW	7/16/52	.....	5.2%
Cheyenne Light, Fuel & Power	IBEW	6/ 1/52	.....	4.4%
Cleveland Electric Illuminating	UWU	4/ 1/52	2,800	12½¢ av., Rec'd add. 3¢ c-of-l 3/7/52
Columbus & Southern Ohio Electric	IBEW	2/18/52	1,200	4.2%
Commonwealth Edison & Public Service of Ill.	IBEW	3/52	12,850	12¢–20¢
Connecticut Light & Power	IBEW	6/ 1/52	1,360	6¢
Connecticut Power	IBEW	5/ 1/52	400	4.5%
Consolidated Edison System	UWU	3/ 1/52	25,000	11¢, 10% inc. pension plan (WSB)
Consumers Power	UWU	4/ 1/52 3/ 1/52	4,500	2½¢ 11½¢, add. holiday
Dayton Power & Light	UWU	2/ 2/52	2,100	2%, add. 4¢ c-of-l
Delaware Power & Light	IBEW	1/ 1/52	325	3%
Derby Gas & Electric	UWU	8/ 1/52	300	18¢, 7¢ add. eff. 3/1/53
Detroit Edison	UWU	6/ 2/52	4,000	3¢, add. 3¢ c-of-l eff. 9/1/52; 4¢ eff. 6/53; 4¢ hosp. & ins.
Duquesne Light	IBEW	10/ 1/52	.....	6½%
El Paso Electric	IBEW	1/ 1/53	.....	6.75% (WSB)
Florida Power Corp.	IBEW	7/ 1/52	800	10%
Florida Power & Light	IBEW	4/28/52	3,250	10%
Georgia Power	IBEW	7/ 8/52	4,000	10%
Georgia Power & Light	IBEW	7/21/52	500	10%
Gulf Power	IBEW	3/ 1/52	500	10%
Haverhill Electric	IBEW	11/15/51	200	8.4%
Home Light & Power	IBEW	6/15/52	.....	6¢
Houston Lighting & Power	IBEW	5/26/52	850	18%
Illinois Power	IBEW	11/ 1/51	2,000	9½%
Indiana Public Service	IBEW	5/ 1/52	1,500	7%, Polio Ins.
Interstate Power	IBEW	4/ 1/52	.....	4½%
Iowa Power & Light	IBEW	7/ 1/52	.....	8%
Iowa Southern Utilities	IBEW	6/ 1/52	.....	8%, 4% (WSB)
Kansas Gas & Electric	IBEW	9/27/52	.....	5%
Kansas Power & Light	IBEW	7/ 1/52	.....	5–14%
Lawrence Gas & Electric	IBEW	1/ 1/52	300	8.4% av 10¢, pd. hosp. by co.
Long Island Lighting	IBEW	7/ 1/52	.....	7% (WSB)
Luzerne County Gas & Electric	UWU	1/52	300	2.8%
Metropolitan Edison	IBEW	3/ 1/52	1,200	7%
Memphis Gas, Light & Water Div., Tenn	None	11/ 1/51	2,500	8%
Mississippi Power	IBEW	4/ 1/52	875	10%
Mississippi Power & Light	IBEW	4/ 1/52	.....	10% (WSB)
Missouri Power & Light	IBEW	7/ 1/52 10/ 1/52	.....	8¢ 7¢
Missouri Public Service	IBEW	4/ 1/52	.....	8¢ (WSB)
Missouri Utilities	IBEW	4/ 1/52	.....	6%
Montana-Dakota Utilities	IBEW	4/ 1/52	500	4.2%
Mountain States Power	IBEW	3/ 1/52	.....	6¢, 8¢ (WSB)
Nashville, Tenn, Electric Service	Ind.	2/ 1/52	700	6%
New Bedford Gas & Edison	Ind.	1/52	400	5%
New England Electric System	IBEW	1/ 1/52	5,000	8.4%, Co. pd. hospitalization
New Jersey Power & Light	IBEW	4/ 1/52	400	6–13¢ (WSB)
New York State Electric Co.	IBEW	7/ 1/52	2,000	14½%
Niagara Mohawk Power Corp	IBEW	6/ 1/52	7,000	7% (WSB)
North Alabama Electric Corp.	IBEW	5/ 1/52	.....	15%
Northern Pennsylvania Power	IBEW	6/ 1/52	.....	5%
Northern States Power, Minn.	IBEW	5/ 1/52	6,000	10¢
Northwestern Illinois Gas & Electric	IBEW	8/ 1/52	.....	6%–14%
Ohio Edison	UWU	7/ 1/52	3,000	11½¢
Ohio Power	UWU	2/52	1,700	3%, 3 wks. va./ 15 yrs
Ohio Power	IBEW & Ind.	8/ 1/52	2,525	6½%
Oklahoma Gas & Electric	Ind.	6/ 1/52	2,000	3.5% av
Pacific Gas & Electric	IBEW	4/ 1/52	16,525	4.7%, Add. 1.6% eff. 7/1, fringe benefit
Pacific Power & Light	IBEW	3/26/52	950	7.86%, 3 wks. va./10 yrs (15 yrs)
Pennsylvania Electric	IBEW	5/26/52	2,300	7%
Pennsylvania Power & Light	Ind.	5/19/52	5,000	$1.90 wk, non-sup. 4½¢ construction
Portland General Electric	IBEW	3/ 1/52	1,475	8%, 3 wks. va./ 10 yrs (15 yrs)
Potomac Edison	IBEW	5/ 1/52	.....	5%
Potomac Electric Power	Ind.	6/ 1/52	2,350	9¢ av
Puget Sound Power & Light	IBEW	12/51	1,000	20¢
Public Service Co of Colorado	IBEW	6/ 1/52	.....	4.4%
Public Service Co of Illinois	IBEW	3/ 1/52	.....	15.5¢ av
Public Service Co of Indiana	IBEW	5/ 1/52	1,450	7%
Public Service Co of New Hampshire	IBEW	1/ 1/52	1,050	5.35%, Inc. OT pay and medical benefits
Public Service Co of Oklahoma	IBEW	6/ 1/52	1,325	4.27¢ av
Public Service Electric & Gas	IBEW	5/ 2/52	4,500	7½%
Rockland Light & Power	IBEW	6/ 1/52	.....	6.2%
Salt River Project Agricultural Improvement & Power District	IBEW	1/ 1/52	1,200	5¢, add. 2½¢–17½¢ inequities
Scranton Electric	IBEW	7/ 1/52	525	7%
Sierra Pacific Power	IBEW	5/ 1/52	.....	7%–10% clerical 5½%–6½% physical
South Carolina Electric & Gas	IBEW	1/ 1/52	800	6%
Southern California Edison	IBEW	1/ 1/52	3,500	4.6%
Southern Colorado Power	IBEW	4/16/52	.....	6½¢
Southern Indiana Gas & Electric	IBEW	8/ 1/52	.....	12¢ (WSB)
Southwestern Gas & Electric	IBEW	5/ 1/52	.....	8% (WSB)
Staten Island Edison	IBEW	7/ 1/52	350	9¢, sick pay inc. 5/25 co. pays ½ hosp.
Southwestern Public Service	IBEW	2/29/52	.....	8%
Spoon River Elec. Co-op	IBEW	7/ 1/52	.....	4½%
Tampa Electric	IBEW	7/52	400	10%
Toledo Edison	IBEW	5/29/52	1,025	6%
Tucson Gas, Electric Light & Power	IBEW	3/ 1/52	.....	2% plus $9 mo.
Union Electric Co of Illinois	IUOE	7/ 1/52	1,100	7.1¢
Union Electric Co of Missouri	IBEW	7/ 1/52	4,000	7%
Virginia Electric & Power	IBEW	4/ 1/52	2,500	4.7%, inc. welfare & ins. benefits
Virginia Electric & Power	Ind.	10/ 1/52	1,200	5.23%
Virginia Electric & Power	UWU	10/ 1/52	1,300	8%
Washington Water Power	IBEW	5/ 1/52	.....	9% (WSB)
Western Massachusetts Electric	IBEW	1/ 6/52	1,100	8%
Western Public Service Co Wyoming	IBEW	9/ 1/52	.....	8¢–23¢
West Missouri Power	IBEW	6/ 1/52	.....	$14 mo
West Penn Power	UWU	5/ 1/52	2,500	6.17%, add. holiday
Wisconsin Electric Power Co	IBEW	12/16/51	800	7%
Wisconsin Power & Light	IBEW	6/ 1/52	.....	10.2%
Wisconsin River Power Co.	IBEW	5/ 1/52	.....	2% (WSB)

Sources: Bureau of Labor Statistics, International Brotherhood of Electrical Workers (AFL), and Utility Workers Union of America (CIO).

Notes: (WSB) Subject to WSB approval.

Purchases,

American industry uses more than 177 billion kwhr annually. It purchases fully ¾ of this amount at a cost of more than $1.3 billion.

Electrical World's study of the use of electrical energy by industry, presented here, is the combination of data supplied by the Federal Power Commission and the Bureau of the Census.

Census data is that obtained by the Bureau's Industry Division in its 1950 Survey of Manufacturers. A comparison of data obtained in the Bureau's 1947 Census of Manufacturers is presented.

Data on the capacity and production of non-utility power plants are those compiled annually by the FPC. They combine the reports of nearly 3,000 non-utility power plants.

Sales or interchanges of energy by non-utility power plants do not appear in this study. These total about 5 billion kwhr.

Purchases of Electric Energy by Manufacturing Industries

	Millions of Kwhr		Thousands of Dollars	
	1947	1950	1947	1950
Food and Kindred Products	8,427	10,827	108,531	140,160
Tobacco Manufactures	155	186	2,174	2,685
Textile Mill Products	8,288	10,715	82,456	106,961
Apparel and Related Products	837	*	20,567	28,651
Lumber †	1,503	2,841	19,964	36,771
Furniture and Fixtures	705	856	11,670	14,301
Paper and Allied Products	6,175	7,697	50,606	63,179
Printing and Publishing	1,251	1,738	23,796	31,660
Chemicals	11,963	16,001	85,405	121,052
Petroleum and Coal	3,753	4,721	28,293	36,303
Rubber and Rubber Products	2,650	3,008	24,685	28,839
Leather and Leather Products	475	592	8,888	10,582
Stone, Clay and Glass Products	5,865	7,715	54,878	76,613
Primary Metal Industries	31,428	38,818	188,784	253,370
Fabricated Metal Products	3,739	4,793	53,957	69,396
Machinery (except electrical)	5,401	6,034	71,952	82,861
Electrical Machinery	3,156	3,888	34,578	44,814
Transportation Equipment	5,552	6,991	59,242	77,823
Instruments and Related Products	456	579	6,763	8,677
Miscellaneous Manufactures	1,043	1,568	17,528	25,484
Total	**103,922**	**131,222**	**954,717**	**1,260,182**

Source: Bureau of the Census. * Withheld because of inconsistency of figures. † 1950 & 1947 figures not comparable since Logging Camps and Logging Contractors Industry was excluded from 1947 census, but included in the 1950 Annual Survey of Manufactures.

Capacity and Production of Non-Utility Power Plants
Non-Manufacturing Industries—1951

	Capacity Kw	Production Kwhr
Agriculture, Hunting, and Trapping	6,825	24,111,500
Metal Mining	272,114	1,373,510,241
Anthracite Mining	78,640	379,728,000
Bituminous Coal and Lignite Mining	159,257	424,635,313
Petroleum and Gas Extraction	96,761	377,325,303
Mining of Nonmetallic Minerals	64,180	212,422,830
Railroads	166,104	374,786,058
Inter Urban Railroad and Bus Lines	878,000	1,715,210,000
Trucking and Warehousing	3,882	15,061,000
Pipe Line Transportation	4,805	17,880,100
Utilities and Sanitary Services	62,011	169,808,324
Merchant Wholesalers	2,347	4,127,390
Government	345,562	954,204,444
Non-Classifiable	26,975	33,854,541
Total	**2,167,463**	**6,076,665,044**

Source: Federal Power Commission.

Capacity and Production of Non-Utility Power Plants
Manufacturing Industries

	1950		1951	
	Capacity Kw	Production Kwhr	Capacity Kw	Production Kwhr
Food and Kindred Products	519,095	1,741,976,805	613,716	1,924,111,470
Tobacco Manufactures	31,468	42,837,585	51,315	88,281,665
Textile Mill Products	647,122	1,608,333,946	791,257	2,141,140,592
Apparel and Related Products	8,358	6,793,816	7,442	5,457,650
Lumber	426,582	1,181,470,701	496,428	1,367,230,761
Furniture and Fixtures	65,043	104,783,833	69,030	102,114,691
Paper and Allied Products	1,880,177	10,327,889,311	2,392,308	12,681,001,325
Printing and Publishing Industries	18,167	21,696,686	17,770	21,117,121
Chemical and Allied Products	1,821,488	9,333,140,333	1,984,451	11,194,072,522
Petroleum and Coal Products	542,652	2,847,869,460	683,020	3,634,965,283
Rubber Products	155,331	779,975,589	160,031	730,843,317
Leather and Leather Products	61,468	177,011,539	66,243	89,090,499
Stone, Clay, and Glass Products	435,011	2,038,419,026	490,391	2,507,077,061
Primary Metal Industries	2,705,510	14,315,508,757	3,338,635	16,981,599,956
Fabricated Metal Products	58,709	115,889,079	69,525	127,640,977
Machinery (except electrical)	197,863	359,638,163	301,027	769,966,400
Electrical Machinery	158,015	481,639,770	208,949	752,744,493
Transportation Equipment	177,838	490,008,640	530,822	1,585,603,399
Instruments and Related Products	58,640	241,138,799	64,465	255,939,838
Miscellaneous Manufactures	32,710	59,135,425	48,592	106,869,833
Total	**10,001,247**	**46,275,157,963**	**12,315,417**	**57,066,868,853**

Source: Federal Power Commission.

& Use of Electric Energy by Industry

Manufacturers of the primary metals industry group, including aluminum, steel, and copper producers, use 14% of the energy consumed by industry. Of the more than 25 billion kwhr used by this group, 63% is purchased electricity.

This industry group is both the largest purchaser and nonutility producer of electrical energy for industry use.

Manufacturers of chemicals, the second largest users of electrical energy, consume less than half the energy consumed by the primary metals group.

Manufacturers of paper and allied products rank third.

Use of Electric Energy by Manufacturing Industries—1950
Millions of Kwhr

	Industrial Self Generation	Energy Purchases	Total Use
Food and Kindred Products	1,742	10,827	12,569
Tobacco Manufactures	43	186	229
Textile Mill Products	1,608	10,715	12,323
Apparel and Related Products	7	*	*
Lumber	1,181	2,841	4,022
Furniture and Fixtures	105	856	961
Paper and Allied Products	10,328	7,697	18,025
Printing and Publishing Industries	22	1,738	1,760
Chemical and Allied Products	9,333	16,001	25,334
Petroleum and Coal Products	2,848	4,721	7,569
Rubber Products	780	3,008	3,788
Leather and Leather Products	177	592	769
Stone, Clay and Glass Products	2,038	7,715	9,753
Primary Metal Industries	14,316	38,818	53,134
Fabricated Metal Products	116	4,793	4,909
Machinery (except electrical)	360	6,034	6,394
Electrical Machinery	482	3,888	4,370
Transportation Equipment	490	6,991	7,481
Instruments and Related Products	241	579	820
Miscellaneous Manufacturers	59	1,568	1,627
Total	**46,276**	**131,222**	**177,498**

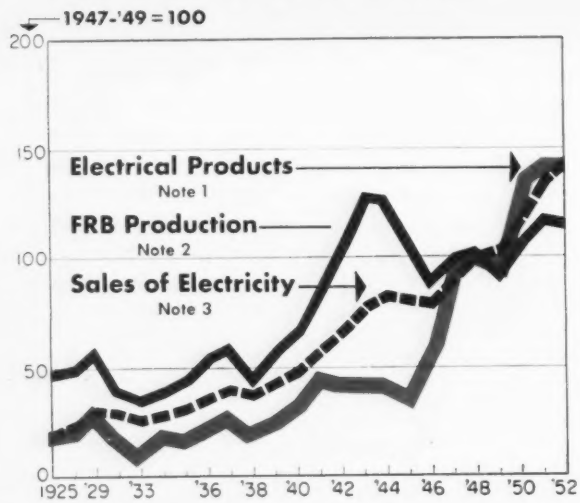
Source: Federal Power Commission, Bureau of the Census.
* Withheld because of inconsistency of figures.

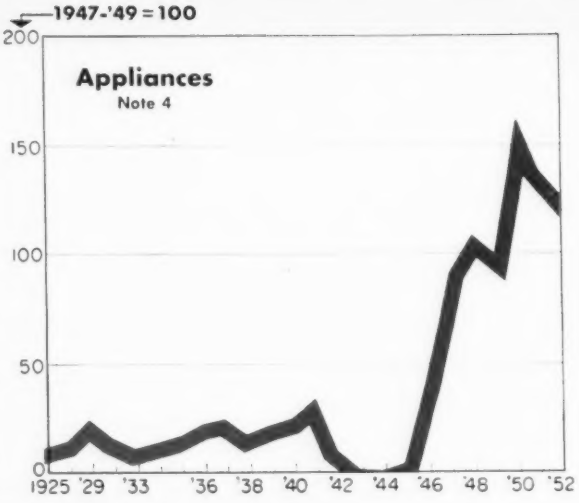
Production and Capacity of Non-Utility Power Plants—1951

	Capacity—Kw				Production—Millions of Kwhr			
	Hydro	Steam	Internal Combustion	Total	Hydro	Steam	Internal Combustion	Total
Agriculture, Hunting, and Trapping	3,600	3,025	200	6,825	10.7	13.4	.....	24.1
Metal Mining	17,323	247,806	6,985	272,114	46.1	1,325.9	1.6	1,373.6
Anthracite Mining	.....	78,640	.....	78,640	.....	379.7	.....	379.7
Bituminous Coal and Lignite Mining	.....	158,757	500	159,257	.....	424.6	*	424.6
Petroleum and Gas Extraction	.....	46,175	50,586	96,761	.....	155.4	222.0	377.4
Mining of Nonmetallic Minerals	462	53,500	10,218	64,180	0.2	199.6	12.7	212.5
Food and Kindred Products	4,319	587,429	21,968	613,716	16.6	1,864.0	43.6	1,924.2
Tobacco Manufactures	.....	49,315	2,000	51,315	.....	87.5	0.8	88.3
Textile Mill Products	167,921	613,317	10,019	791,257	517.4	1,607.6	16.1	2,131.1
Apparel and Related Products	502	6,940	.....	7,442	1.0	4.4	.....	5.4
Lumber	2,323	485,594	8,511	496,428	4.8	1,347.4	15.1	1,367.3
Furniture and Fixtures	555	67,275	1,200	69,030	1.5	100.1	0.5	102.1
Paper and Allied Products	328,597	1,979,269	14,442	2,322,308	1,869.4	10,787.9	23.7	12,681.0
Printing and Publishing Industries	.....	16,725	1,045	17,770	.....	20.8	0.4	21.2
Chemical and Allied Products	17,750	1,933,634	33,067	1,984,451	80.0	11,009.9	104.2	11,194.1
Petroleum and Coal Products	.....	655,605	27,415	683,020	.....	3,503.8	131.2	3,635.0
Rubber Products	250	158,840	941	160,031	0.3	726.7	3.8	730.8
Leather and Leather Products	1,392	61,421	3,430	66,243	4.2	83.2	1.7	89.1
Stone, Clay and Glass Products	13,638	439,147	37,606	490,391	83.9	2,302.2	121.0	2,507.1
Primary Metal Industries	392,434	2,460,110	486,091	3,338,635	1,741.3	12,520.5	2,719.8	16,981.6
Fabricated Metal Products	3,740	57,955	7,830	69,525	19.3	98.9	9.5	127.7
Machinery (except electrical)	3,081	256,053	41,893	301,027	5.2	646.9	117.9	770.0
Electrical Machinery	2,300	205,441	1,208	208,949	11.5	740.7	0.6	752.8
Transportation Equipment	24,140	493,740	12,942	530,822	149.3	1,429.1	7.3	1,585.7
Instruments and Related Products	610	63,855	.....	64,465	1.8	254.2	.....	256.0
Miscellaneous Manufactures	770	46,489	1,333	48,592	0.3	104.4	2.2	106.9
Railroads	1,900	159,609	4,595	166,104	0.5	364.9	9.3	374.7
Inter Urban Railroad and Bus Lines	9,000	869,000	.....	878,000	44.2	1,671.0	.....	1,715.2
Trucking and Warehousing	.....	410	3,478	3,882	.....	.....	15.1	15.1
Pipe Line Transportation	.....	500	4,305	4,805	.....	.....	17.9	17.9
Utilities and Sanitary Services	.....	22,225	39,786	62,011	.....	65.9	103.9	169.8
Merchant Wholesalers	.....	2,047	300	2,347	.....	3.1	1.0	4.1
Government	3,127	302,630	39,805	345,562	18.2	921.4	14.6	954.2
Non-Classifiable	9,655	16,610	710	26,975	21.5	10.7	1.7	33.9
Grand Total—All Industry	**1,009,389**	**12,599,088**	**874,403**	**14,482,880**	**4,649.2**	**54,775.8**	**3,719.2**	**63,144.2**
Total—Manufacturing Industries	964,322	10,638,154	712,941	12,315,417	4,507.8	46,563.6	3,319.4	54,390.8
Total—Non-Manufacturing Industries	45,067	1,960,934	161,462	2,167,463	141.4	8,212.2	399.8	8,753.4

Source: Federal Power Commission. * Below 100,000 Kwhr.

MANUFACTURING





Trends in Electrical Manufacturing

Shipments of generation, transmission and distribution equipment rose sharply during 1952—reflecting the increasing requirements of the utilities' huge expansion program.

Total Shipments of Electrical Products 1925—1952

Indexes Based on Average Year 1947–49 = 100

	1 Electrical Products	2 F. R. B. Production	3 Sales of Electricity	4 Appliances	5 Illuminating Equipment	6 Industrial Apparatus	7 Building Equip. & Supplies	8 Insulating Materials	9 Insulated Wire and Cable	10 Generation, Trans. and Distri. Equip
1925	17.7	49	21	10.8	24.6	18.8	35.7	27.1	34.6	25.2
1927	20.6	51	26	13.6	32.2	19.8	35.5	26.8	39.3	27.1
1929	29.8	59	32	23.1	34.4	27.4	42.4	38.4	58.0	31.3
1931	18.3	41	31	14.9	19.0	13.7	22.4	19.7	20.7	17.1
1933	11.0	37	28	9.9	7.7	8.9	14.2	14.8	11.6	6.0
1934	13.8	41	30	13.0	10.2	12.0	17.0	17.5	17.1	8.9
1935	17.2	47	33	16.1	14.4	15.5	21.2	23.8	20.2	12.7
1936	22.7	56	38	21.7	20.3	23.6	28.5	30.1	29.8	19.0
1937	28.0	61	42	23.7	23.8	29.8	33.1	32.5	37.4	29.2
1938	20.8	48	40	16.7	24.4	19.8	24.2	18.7	25.1	21.8
1939	25.3	59	45	21.4	31.6	24.8	31.5	27.5	31.0	23.2
1940	32.8	68	50	24.2	45.0	34.3	36.1	36.7	41.0	31.2
1941	46.4	88	59	32.9	65.1	62.2	58.3	66.9	73.6	46.6
1942	43.3	108	68	10.2	55.1	94.0	59.2	90.8	83.7	57.8
1943	43.0	129	79	1.8	25.6	128.9	54.9	119.2	77.0	51.9
1944	43.0	127	84	1.1	26.1	122.6*	56.3	107.3	79.4	47.2
1945	38.0	110	82	4.1	40.6	85.8	53.5	86.1	57.2	40.7
1946	58.8	92	81	44.6	83.6	68.5	64.6	75.2	77.6	40.1
1947	99.1	101	92	91.4	100.1	109.1	105.8	104.5	110.4	83.4
1948*	102.4	104	102	108.4	103.0	105.7	111.4	105.5	108.2	113.0
1949*	98.4	95	105	100.2	96.9	85.1	82.9	90.0	86.3	103.6
1950*	136.1	108	119	161.5	117.7	114.1	115.4	128.6	137.5	102.5
1951*	143.7	119	135	135.6	144.3	166.2	149.0	165.7	162.6	135.3
1952	143.6	117	145	127.0	120.0	168.7	127.0	154.1	173.3	168.9

1. Electrical Products index based on total shipments of electrical products which are considered to cover not only those products included in the Electrical Machinery Group as defined by the U. S. Census of Manufacturers, but also lighting equipment, steam engines and turbines, household and commercial refrigeration machinery, air conditioning machinery, household laundry equipment, vacuum cleaners, and electrical insulating materials such as porcelain, mica, laminated products, vulcanized fiber, varnished fabric and paper etc.

2. F. R. B. Production index based on the Federal Reserve Board's revised index for total industrial production, unadjusted, and adjusted to 1947-1949 = 100

3. Sales of Electricity index based on Edison Electric Institute's data on total kilowatt hour sales.

4. Appliance index based on shipments of household refrigerators, farm and home freezers, fans, household ranges, household dishwashers and food waste disposal units, water heaters, vacuum cleaners, household washing and ironing machines, dryers, electric housewares, commercial cooking equipment and radio and television receiving sets.

5. Illuminating Equipment index based on shipment of industrial, commercial and residential lighting fixtures, floodlights, street lighting equipment and aviation ground lighting equipment.

6. Industrial Apparatus index based on shipments of electric welding equipment and wire, industrial controls, industriel heating units and devices, motors and generators (except large apparatus), metallic rectifiers, induction and dielectric heating apparatus, electronic tubes (except radio), carbon products, mining belt conveyors, mining and industrial locomotives and resistance welders.

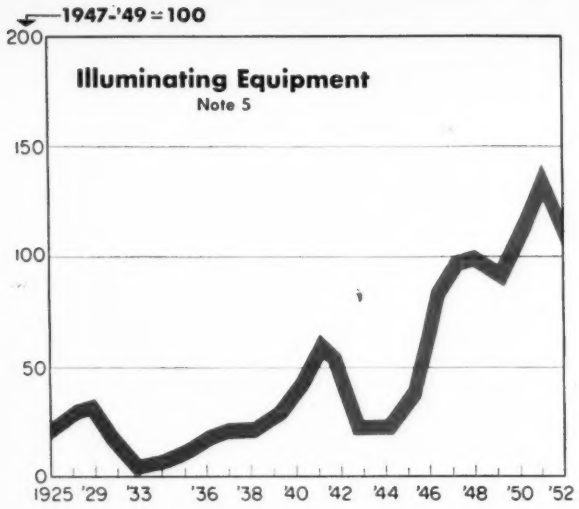
7. Building Equipment & Supplies index based on shipments of wiring devices, molded case circuit breakers, conduit fittings, metallic and plastic outlet and switchboxes, fuses, panelboards and distribution boards, knife and enclosed switches and busways.

8. Electrical Insulating Materials index based on shipments of dry process and standard electrical porcelain, electrical insulating varnish, manufactured electrical mica, varnished fabric and paper, varnished tubes and saturated sleeving, vulcanized fibre and laminated products.

9. Insulated Wire and Cable for Light and Power index based on shipments of armored cable, magnet wire, rubber power cable, asbestos and paper insulated wire and cable, varnished cambric cable, rubber sheathed cord and cable, building wire and cable, flexible cords and cord sets.

10. Generation, Transmission and Distribution Equipment Index based on shipments of power capacitors, electrical measuring equipment, hydraulic and steam turbines, high voltage insulators, large generating and converting apparatus, switchgear, power and distribution transformers, lightning protective devices, feeder voltage regulators and overhead trolley line materials.

Source: National Electrical Manufacturers Association. * Revised.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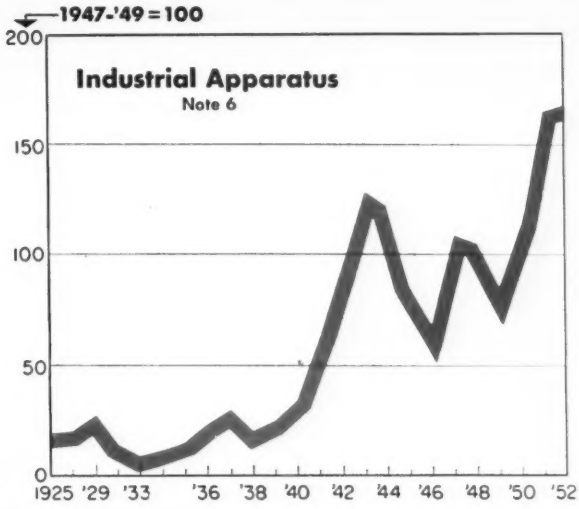
1947-'49 = 100
Industrial Apparatus
Note 6
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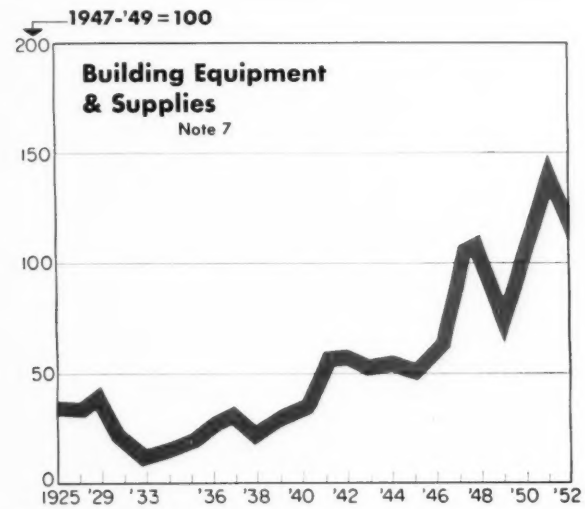
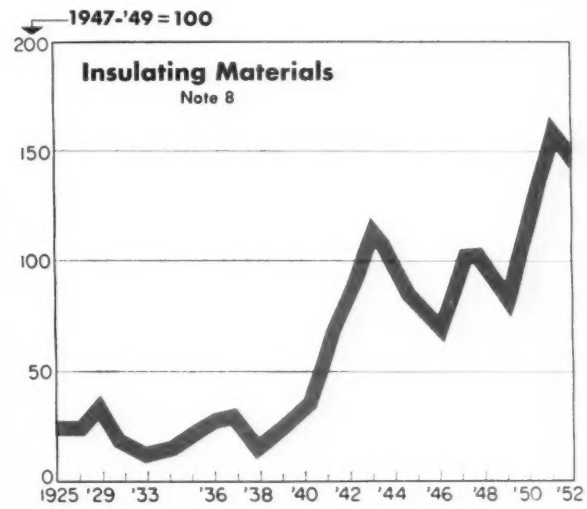
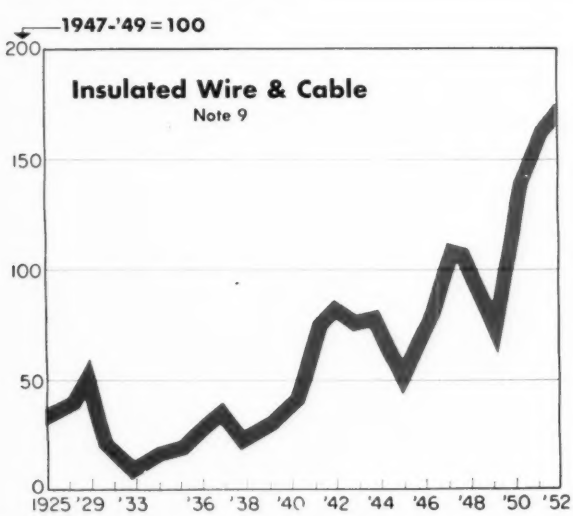
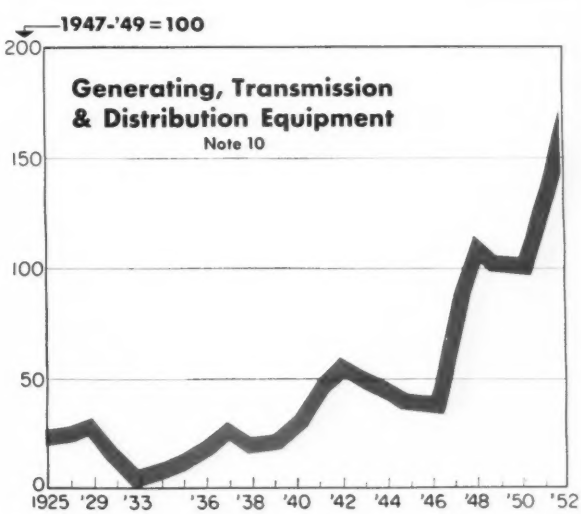
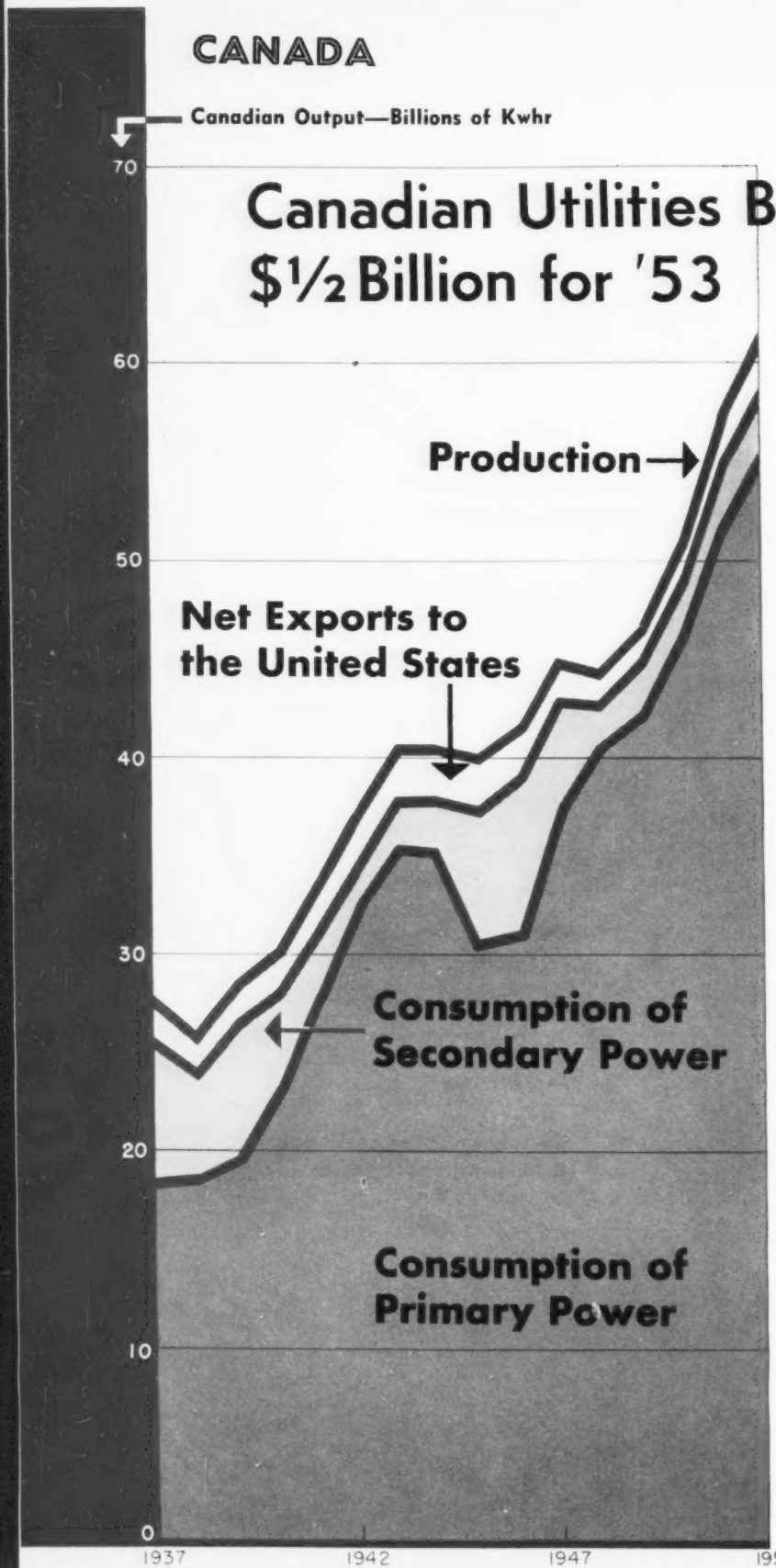
150
100
50
0
1925 '29 '33 '36 '38 '40 '42 '44 '46 '48 '50 '52


1947-'49 = 100
Building Equipment
& Supplies
Note 7
200
150
100
50
0
1925 '29 '33 '36 '38 '40 '42 '44 '46 '48 '50 '52


1947-'49 = 100
Insulating Materials
Note 8
200
150
100
50
0
1925 '29 '33 '36 '38 '40 '42 '44 '46 '48 '50 '52


1947-'49 = 100
Insulated Wire & Cable
Note 9
200
150
100
50
0
1925 '29 '33 '36 '38 '40 '42 '44 '46 '48 '50 '52


1947-'49 = 100
Generating, Transmission
& Distribution Equipment
Note 10
200
150
100
50
0
1925 '29 '33 '36 '38 '40 '42 '44 '46 '48 '50 '52



Canadian Utilities Budget $½ Billion for '53

Construction by Canadian electric utilities totaled $569 million in 1952. Estimates for 1953 indicate that total expenditures will reach $538 million.

Estimates presented here are founded on reports from utilities operating 65.6% of Canada's capacity and serving 56.8% of its electric customers. Included is the report of the Aluminum Company of Canada.

More than 50% of Canada's announced expenditures will be for the construction of hydroelectric stations. Transmission and distribution facilities will each receive 20% of the budgeted expenditures. Expansion of thermal generation and general plant facilities will require the remaining 10%.

Production . . . Utilities reporting monthly to the Dominion Bureau of Statistics produced an estimated 61,613 million kwhr during 1952. This is 7.3% over the 57,421 million kwhr produced during 1951.

The consumption of power rose to an estimated 58,932 million kwhr. Exports to the United States reached an estimated record 2,681 million kwhr.

Secondary power, the greater part of which is used by pulp and paper mills in electric boilers where short interruptions can be tolerated, is interruptible. The consumption of primary power is computed by deducting exports and the consumption of secondary power from production. Consequently it includes losses.

Canadian Electric Utility Expenditures & Construction

Expenditures — Thousands of Dollars

	Fuel	Hydro †	Transmission	Distribution	Miscellaneous	Total†	Maintenance	Substations
1950	35,880	185,044	142,357	122,278	25,390	510,949	38,000	93,132
1951	56,264	243,544	121,419	136,747	21,227	579,201	43,117	90,365
1952 Estimated	48,687	280,929	111,234	114,754	13,322	568,926	52,063	77,965
1953 Contemplated	32,143	270,122	109,172	107,241	19,475	538,153	66,770	81,945

† Includes expenditures by the Aluminum Company of Canada.

Construction

	Circuit Miles of Transmission Line					Pole Miles of Primary Distribution— 25 kv & Below	Substation Capacity— Thousands of kva
	6.6-22 kv	22-44 kv	44-110 kv	110-220 kv	220 kv & up		
1950	4,382	2,207	1,349	1,371	1,300	19,627	3,707
1951	4,349	1,420	1,069	1,123	.....	15,919	3,368
1952 Estimated	5,518	1,462	1,283	438	167	18,418	4,261
1953 Contemplated	6,179	1,649	714	903	120	20,534	5,054

Capacity Additions Reported to Electrical World—Kva

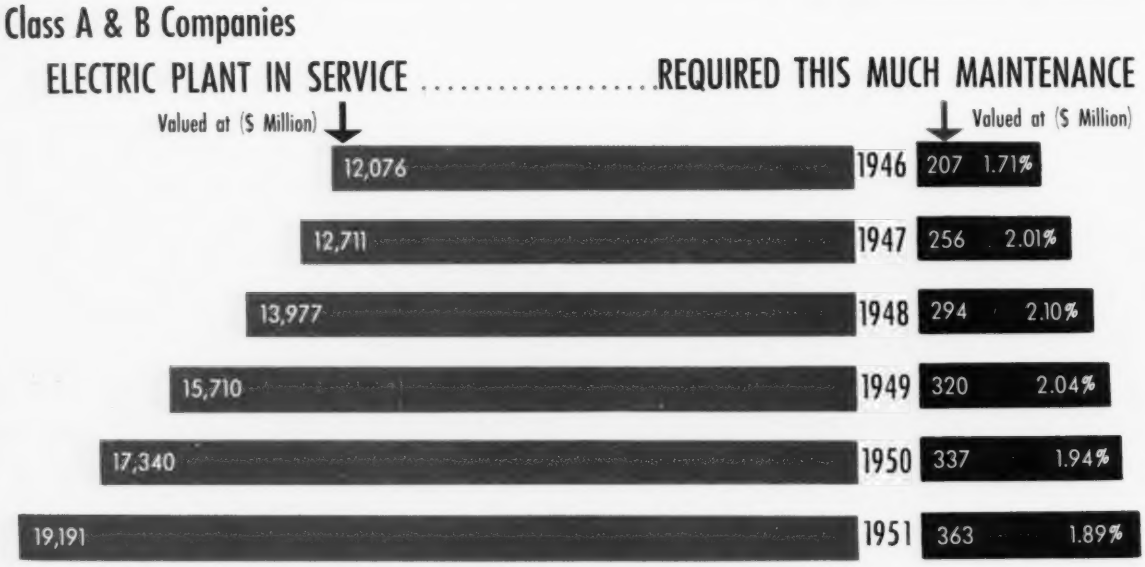
	1950	1951	1952	1953	1954	1955	After 1955
Hydro							
Aluminum Company of Canada Ltd	.....	.....	200,000	200,000	335,000	.....	.....
Beauharnois Light, Heat & Power Co	93,250	186,500	139,975	139,975	.....	.....	.....
British Columbia Electric Co Ltd	38,000	41,500	75,000	.....	50,000	50,000	200,000
British Columbia Power Commission	.....	28,000	3,750	50,000	50,000	34,000	.....
Calgary Power Ltd	.....	82,750	.....	4,500	22,000	17,000	.....
Great Lakes Power Co Ltd	10,750	.....	.....	17,000	10,000	.....	.....
Hydro-Electric Power Commission of Ontario	497,000	152,000	189,000	27,000	360,000	483,000	161,000
Manitoba Hydro-Electric Board	.....	31,000	62,000	.....	27,600	27,600	.....
New Brunswick Electric Power Commission	.....	.....	.....	25,000	.....	.....	180,000
Newfoundland Light & Power Co Ltd	.....	13,780	7,000	10,000	.....	20,000	.....
Northwest Territories Power Commission	.....	.....	3,000	.....	.....	.....	3,000
Nova Scotia Light & Power Co Ltd	4,500	.....	4,000	.....	8,500	.....	.....
Nova Scotia Power Commission	10,000	.....	7,500	.....	4,500	6,000	.....
Pembroke Electric Light Co Ltd	2,812	2,812	.....	.....	.....	.....	.....
Quebec Hydro-Electric Commission	.....	12,000	.....	.....	.....	.....	.....
Shawinigan Water & Power Co	130,000*	195,000*	.....	.....	.....	200,000*	.....
Winnipeg Electric Co	32,500	.....	32,500	.....	.....	.....	.....
Steam							
Canadian Utilities Ltd	.....	.....	7,500**	.....	.....	6,000**	.....
Manitoba Hydro-Electric Board	.....	.....	.....	.....	.....	.....	120,000**
New Brunswick Electric Power Commission	.....	7,810	7,810	18,750	.....	.....	.....
Nova Scotia Light & Power Co Ltd	.....	23,500	.....	26,000	.....	32,300	60,000
Nova Scotia Power Commission	.....	12,500	12,500	.....	.....	25,000	.....
Hydro-Electric Power Commission of Ontario	76,000	147,000	226,000	233,000	.....	.....	.....
Saskatchewan Power Corp	.....	16,250	43,700	25,000	30,000	.....	.....
Winnipeg Municipal Hydro Electric System	.....	.....	17,650	19,400	.....	.....	.....
Internal Combustion							
British Columbia Electric Co Ltd	.....	862	.....	.....	.....	.....	.....
British Columbia Power Commission	4,700	5,400	4,675	3,750	1,875	.....	.....
Canadian Utilities Ltd	.....	1,400**	.....	9,375**	.....	1,200	.....
Newfoundland Light & Power Co Ltd	.....	.....	.....	32,000	.....	.....	.....
Northwest Territories Power Com	437.5	.....	.....	.....	.....	.....	.....
Nova Scotia Power Commission	998	.....	1,588	.....	.....	.....	.....
Saskatchewan Power Corp	3,800	.....	1,700	2,500	3,000	.....	.....

Source: "Electrical World" Survey. * Horsepower ** Kw

Canadian Output

	Consumption of Primary Power	equals Production less	Consumption of Secondary Power	less	Net Exports to United States
1944	35,150,740,000	40,465,733,000	2,743,121,000		2,571,872,000
1945	30,823,539,000	40,100,608,000	6,645,824,000		2,631,245,000
1946	31,063,240,000	41,603,708,000	8,067,489,000		2,472,979,000
1947	37,375,518,000	44,986,364,000	5,595,344,000		2,014,502,000
1948	40,606,749,000	44,568,849,000	2,303,987,000		1,658,113,000
1949	42,102,584,000	46,673,214,000	2,839,940,000		1,730,690,000
1950	46,084,703,000	50,902,519,000	2,893,384,000		1,924,428,000
1951	51,916,062,000	57,420,518,000	3,136,712,000		2,367,744,000
1952*	55,291,000,000	61,613,000,000	3,641,000,000		2,681,000,000

Source: Dominion Bureau of Statistics. * 1952 Estimated by "Electrical World". Newfoundland not included prior to 1950.



Maintenance Costs Reduced

Outstanding has been the electric utility industry's ability to reduce maintenance costs.

Long standing deferment of maintenance during World War II required a sharp increase in maintenance after 1946. By 1948 maintenance had risen to 2.10% of electric plant in service. In 1949 this figure fell to 2.04%, in 1950 to 1.94%, and in 1951 to 1.89%.

When adjustments are made for increases in the cost of material and labor, we find a 22.7% reduction in the real cost of maintenance has been made since 1947.

Maintenance Expenditures
Thousands of Dollars

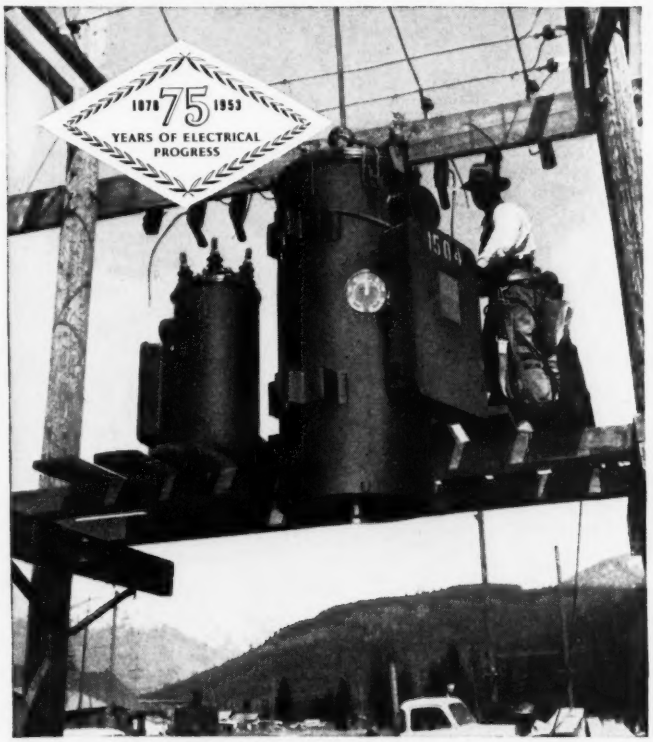
	1952	1953
New England	31,303	32,371
Middle Atlantic	119,598	126,353
East North Central	109,713	116,218
West North Central	36,604	30,771
South Atlantic	46,871	49,766
East South Central	14,921	15,661
West South Central	26,370	27,814
Mountain	11,731	12,787
Pacific	42,761	43,882
United States	439,872	455,623

Source: "Electrical World" Survey. Includes Private, Municipal, State & Power District Systems.

Maintenance Expenditures Privately Owned Class A and B Electric Utilities
Thousands of Dollars

	1947	1948	1949	1950	1951
Steam	96,683—37.8%	109,489—37.4%	117,864—36.8%	120,340—35.7%	130,995—36.1%
Hydro	12,056— 4.7	12,798— 4.3	15,584— 4.9	14,361— 4.3	15,265— 4.2
Internal Combustion	1,784— 0.7	2,322— 0.8	2,054— 0.6	1,566— 0.5	1,591— 0.4
Transmission	22,414— 8.8	24,335— 8.3	28,069— 8.8	27,953— 8.4	30,671— 8.5
Distribution	114,160—44.5	134,939—45.9	145,639—45.5	160,649—47.7	170,583—47.0
General	8,892— 3.5	9,771— 3.3	10,723— 3.4	11,591— 3.4	13,433— 3.7
Total	255,989—100	293,654—100	319,933—100	336,459—100	362,538—100

Source: Federal Power Commission.



BETTER VOLTAGE will be supplied to customers of the Mountain States Power Co. because of the small voltage steps of the ML32's shown here being installed in the Sandpoint, Idaho, area.

Set new voltage standards on your branch and rural circuits

New G-E 32-step regulator features Class 1 accuracy, ±10% regulation, improved switching... at no extra cost

General Electric's new ML32 single-phase voltage regulator costs no more than the ML8 it supersedes. Yet its wider range, closer regulation and smaller steps permit you to set new standards of service on your branch and rural feeders.

The new ML32 offers 20% regulation—10% raise and 10% lower in thirty-two 5/8% steps. Its controls meet rigid ASA Standards for Class 1 accuracy—99% accuracy regardless of operating changes in temperature, frequency or load. And its improved switching mechanism makes tap changes at optimum speed to assure long contact life and a minimum of maintenance.

G-E ML32 step voltage regulators can be obtained for 2500, 5000, 6900, 7200, 7600, and 7960-volt single-phase feeders and the corresponding wye voltages. For complete information, see your local G-E Sales representative. Or write for bulletin GEA-5752, General Electric Co., Schenectady 5, New York. 423-1

OPTIONAL MOUNTING of controls at base of pole—an additional feature of the new G-E ML32—facilitates inspection and adjustment. Note modernized control panel with all control knobs conveniently located.

There's a G-E voltage regulator for every application

GENERAL ELECTRIC

DOWNTOWN AREA of Beaumont, Texas, now enjoys the better continuity and uniformly good voltage of a secondary network. Workmen above are installing new 500-kva G-E network unit on Tevis Street between Pine and Travis Streets.

Beaumont installs a network to handle heavy load growth

Installation of this G-E network unit illustrates only step that will be needed in future to add new distribution capacity

As today's rapidly expanding urban loads make it difficult to perpetuate radial systems, more and more electric utilities install secondary networks.

They find that, once installed, a network gives them complete flexibility for solving load growth problems —on an orderly step-by-step basis—without any rearrangement of secondaries or service entrances.

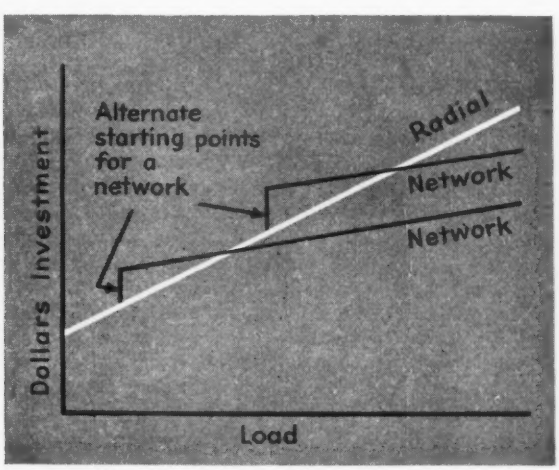
In Beaumont, Texas, for example, the Gulf States Utilities Co. found that it required extensive engineering calculations, juggling of existing loads and bolstering of circuits to meet increased loads in the downtown area. As a result it retired its radial system in favor of a network.

NO MORE LOAD GROWTH "HEADACHES". Now, when rising loads require additional capacity, all that will be necessary will be additional network units. With a network, service connections and low-voltage connections are provided initially thus eliminating any need for rearrangement or re-enforcement when a new transformer is added.

HELP FOR YOUR SYSTEM. If you, too, are struggling to accommodate new loads by perpetuating a radial system and your load density has risen to approximately 10,000 to 15,000 kva per square mile, it may be time for you to investigate the flexibility and economy of a secondary network.

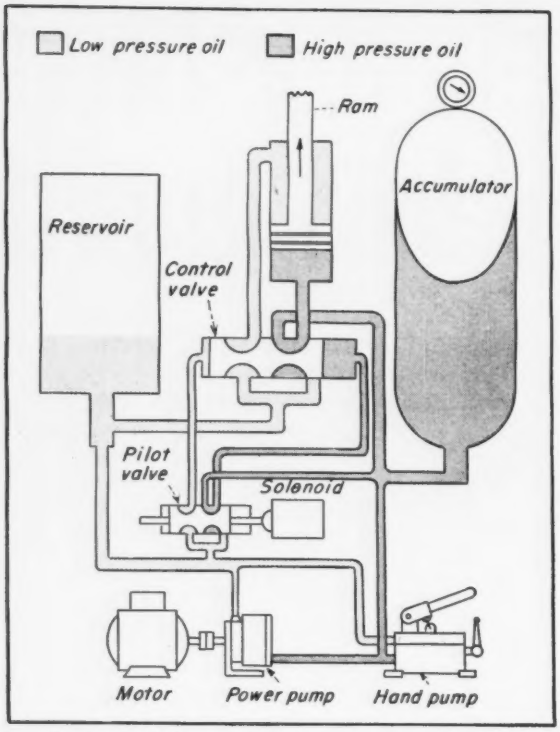
For help in solving your network problems, and for complete information on the many advantages of G-E standardized network units, get in touch with your local G-E Apparatus sales office. Or write to Section 402-129 for Bulletin GEA-5024. General Electric Company, Schenectady 5, N. Y.

VAULT SIZE MINIMIZED when you install G-E standardized network equipment since both high- and low-voltage cable terminals are well below the top of the transformer. Vault depth need be only 7 feet to roof slab to provide sufficient room for maintenance and inspection.

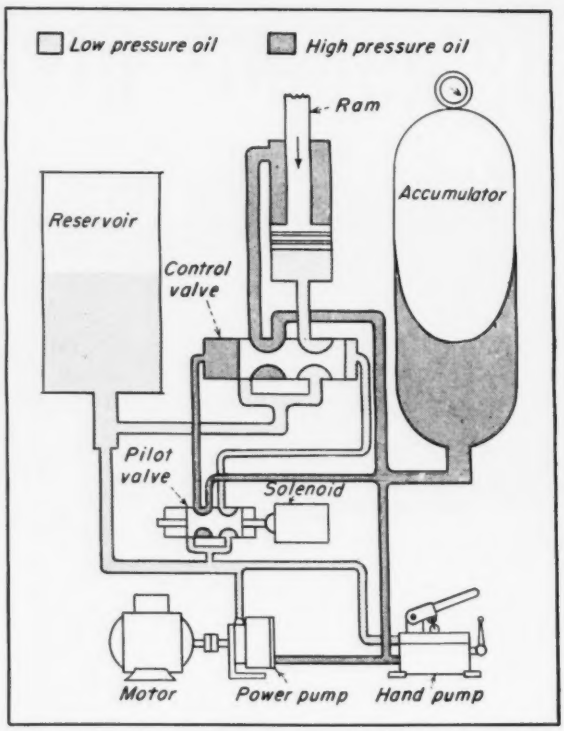


IT PAYS TO START A NETWORK. Although the change from a radial system to a network system means some initial expense, future increases in capacity require less investment with a network. And with a growing load, the sooner the network is started, the lower the ultimate cost.

GENERAL ELECTRIC

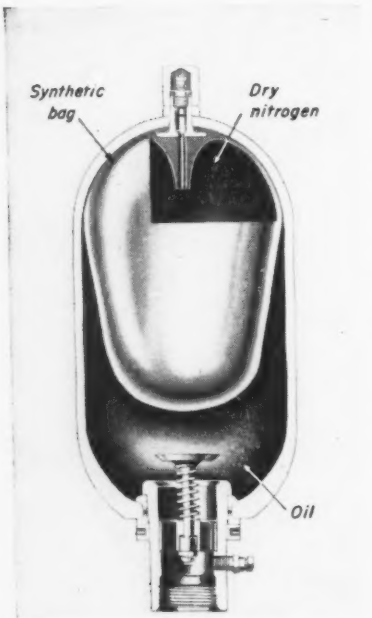


HYDRAULIC OPERATOR'S fluid system showing ram surging up to close the circuit breaker after the solenoid is energized



HYDRAULIC RAM is forced to its original position after closing the circuit breaker by change in the valves positions

Pneumo-Hydraulic Operator Closes Breakers



PNEUMO-HYDRAULIC ACCUMULATOR is the energy reservoir that permits multiple operations of the operator. Synthetic bag is charged with dry nitrogen. This applies pressure to oil throughout the system

E. R. PERRY and N. W. MORELLI, Circuit Breaker Engineering Section, Allis-Chalmers Mfg Co, Boston, Mass.

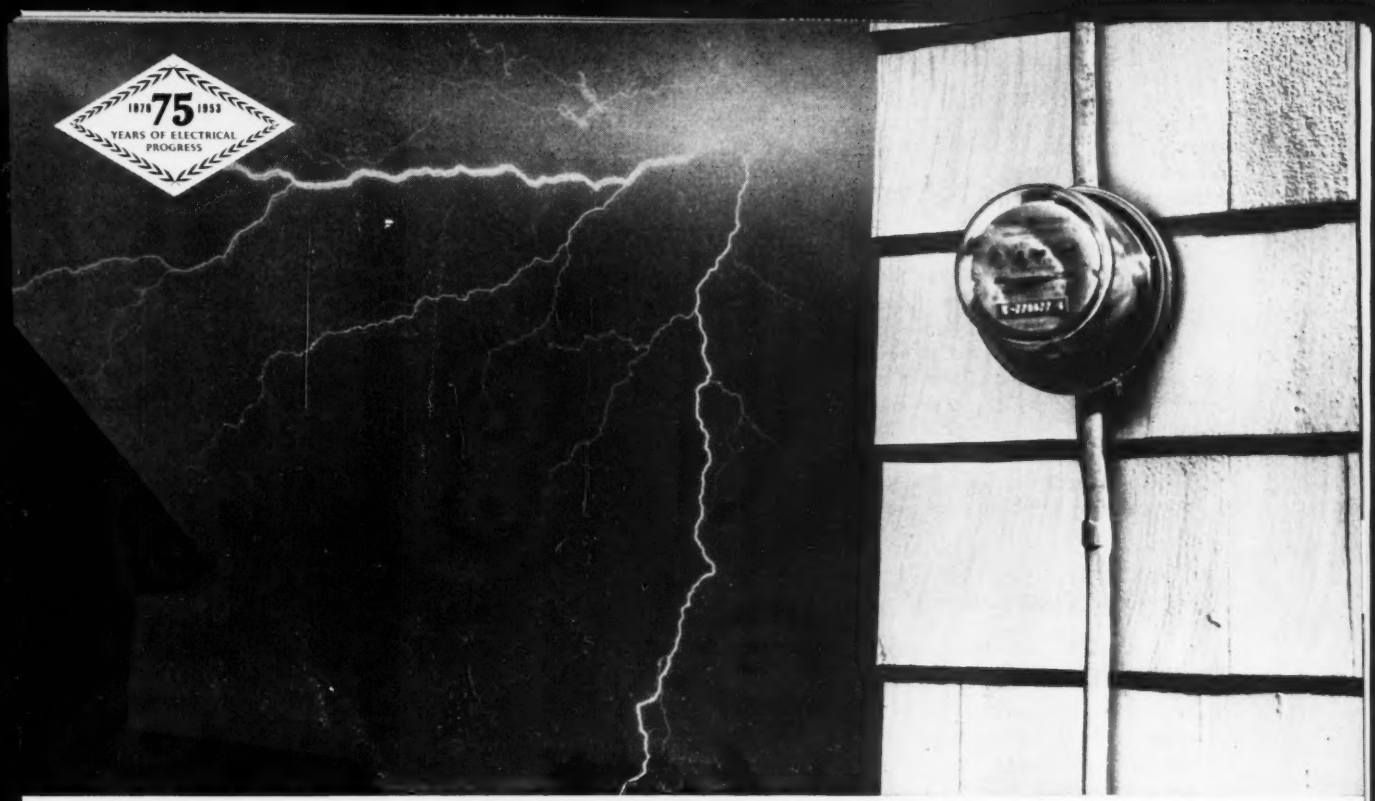
A new hydraulic operator has been developed for rapidly closing or reclosing large circuit breakers. Multiple, high speed operations of the actuator are obtained by using hydraulic energy stored in a pneumo-hydraulic accumulator at 3,000 psi.

Operation . . . The operator's functioning is as follows: Normally, the ram, which is connected to the circuit breaker actuating mechanism, is at the lower limits of its travel and both valve spools are positioned to the right. When the solenoid is energized, the pilot valve spool snaps to the left. Oil from the accumulator surges into the right hand chamber of the control valve, forcing that spool to the left. High pressure oil then rushes into the lower end of the ram's cylinder and drives the ram upward to close the breaker.

As the ram closes the breaker, it trips a limit switch opening the solenoid circuit. A spring, contained in the solenoid, instantly returns the pilot valve spool to the right allowing oil to surge through it and into the left hand chamber of the control valve. This forces the control valve's spool to the right. Oil then rushes in above the ram's piston driving it back to the original position to complete the cycle.

Oil above the piston on the upward stroke and oil under the piston on the downward stroke is exhausted through the control valve to the reservoir. Likewise, oil in the control valve's chamber in the direction the spool moves is exhausted through the pilot valve to the reservoir. The reservoir, which is vented to the atmosphere, contains a baffle arrangement to reduce aeration of the oil.

Pumps . . . Two pumps are incorporated in the operator's oil system. A gravity fed, motor driven pump is used to automatically maintain pressure in the high pressure and accumu-



Even in cases of severe lightning surges, results show that you will . . .

Reduce Lightning Losses, Save Repair Costs With G-E Certified I-50 Watthour Meters

Service experience in severe lightning areas has shown that General Electric I-50 watthour meters have an unusual record of maintenance-free operation. This results from several significant design achievements embodied in the I-50.

The I-50 potential coil is molded of polyethylene insulation and the current coil is butyl-molded. The result: long life and high impulse strength.

RETARDING MAGNETS are of high-coercive alnico V encased in and shielded by the die-cast aluminum frame. This shielding provides additional protection against decalibration resulting from lightning surges.

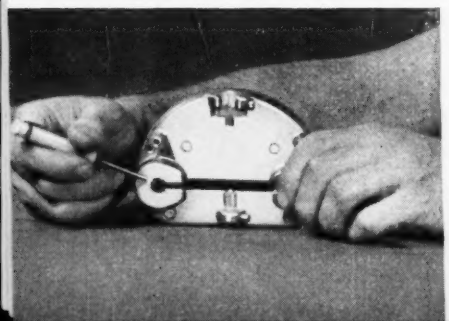
Relief gaps, co-ordinated with coil insulation, protect the meter by confining any spark-over to a point of minimum possible damage.

THE RESULT of this careful I-50 design has been an unusual freedom from operational failures, physical damage, or decalibration in service. This means savings to utilities in repair and maintenance costs.

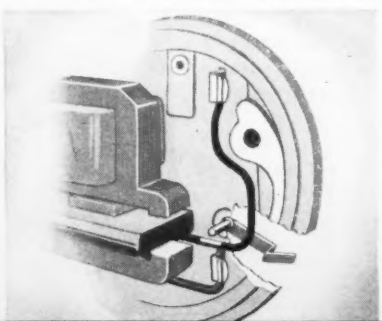
For more information about the G-E certified I-50 watthour meter, ask for a showing of our new motion picture, "Accent on Accuracy." Call your nearest G-E representative or write General Electric Company, Schenectady 5, New York. 601-92

GENERAL ELECTRIC

RETARDING MAGNETS of alnico V, shielded by the aluminum frame, provide added protection against decalibration.



RELIEF GAPS are located so that the current-coil and potential-coil insulation will not be damaged by flashover.



MOLDED COIL insulation of I-50 meter securely holds coils to laminations and gives high dielectric strength and long life.

lator circuit within the operating range. The other, a hand pump, serves a dual purpose.

During emergencies or when the control power is off, it is occasionally desirable to close the circuit breaker. Sufficient energy can be stored in the accumulator by operating the hand pump for a minute to provide one breaker operation at full speed. When the hand pump is operated for a longer period, a fully charged system can result.

The other purpose of the hand pump is to close the breaker slowly. At any intermediate position, the breaker contacts can be held stationary for maintenance work by a check valve located in the pump. This manual valve can also be used to release pressure at a controlled rate to slowly open contacts.

Solenoid Valve . . . To obtain a rapid response characteristic, a solenoid actuated pilot valve was incorporated in the hydraulic operator. Without this quick acting valve it would be necessary to have a large solenoid operate the control valve. Such a solenoid would require excessive time for the flux build-up.

Accumulator . . . Storage of energy to operate the ram is obtained from a pneumo-hydraulic accumulator. Its shell is made from a homogenous steel alloy, free from seams, welds or joints. A moulded synthetic bag serves as a separator between dry nitrogen inside the bag and oil that surrounds it. Precharging with nitrogen from an external source is accomplished through an integrally moulded valve in the top of the accumulator. In the oil discharge port is a poppet valve to prevent extruding of the bag through the port during precharging, thus protecting the bag.

Roll-Winder Saves Armor Tape

JOHN J. CASSELL, Distribution Dept, Appalachian Electric Power Co, Marion, Virginia

Savings in time and material, and avoidance of hazards, are some benefits that have been obtained by using a device like that illustrated to wind aluminum armor-tape into convenient rolls for linemen's use.

With such a device the issuing clerk or material man can wind the tape into proper lengths for required applications, or multiples of these lengths, thus avoiding the waste incurred by cutting the tape into haphazard lengths on the job. By having convenient-size rolls of tape, linemen save time on the job, and avoid hazards sometimes present when long lengths of tape are sent up to them. With rolls containing predetermined lengths of tape, less tape becomes scrap, thereby saving considerable quantities of material.

WINDING DEVICE (right) coils aluminum armor tape of predetermined lengths into rolls

To wind a conventional roll of tape, one end is inserted in the slot in the ¾-in. bolt to which the winding crank is attached. Zig-zag slots in the top of the winder permit mounting the upper roller in four different positions. These positions determine the size of the roll that can be wound, according to the length required.

Large Wheel Cart Prevents Sod Damage

BEN GLUNT, Cincinnati Gas & Electric Co, Cincinnati, Ohio

Three wheel carts constructed by Cincinnati Gas & Electric Co for hauling poles and transformers are designed to prevent sod damage. These carts have large balloon tires and utilize parts from the rear wheel assembly of a surplus bomb trailer. The steel frame carts have a hinged tongue and swivel front wheel to make them readily maneuverable. Loads are centered over the large rear wheels.

When transporting the cart to the job, the tongue is folded back and the ring that is fastened to the cart's frame is attached to the truck's trailer hook. In this position, the front swivel wheel is off the road.

BALLOON TIRE CART is used to transport poles and transformers across lawns. Tongue aids the maneuverability of the cart

New G-E Boiler-feed-pump Motor

A true power station motor from top to bottom, General Electric's new Boiler-feed-pump Motor offers you many features—among them:

- **Cubical shape reduces width.**
- **Air discharge out top permits mounting motors closer together, improves employee comfort.**
- **Streamlined rotor improves performance—is quieter.**
- **Modern appearance blends with power station styling.**

For more complete information, ask your G-E representative for Bulletin GEA-5813, or write Section 753-1, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

Transformer Excitation Connections

To meet the excitation requirement provision must be made to permit the magnetizing current to assume the wave form which will produce a sine wave of flux. The latter induces a sine wave of voltage

J. B. **HODTUM**, Manager, Central Station Engineering,
Allis Chalmers Mfg. Co, Pittsburgh, Pa.

Requirements for proper excitation of three phase connections are shown in the diagrams. Solid arrows indicate the path of the triplen frequency magnetizing currents to produce sine-wave voltages. Dashed arrows indicate that triplen frequency magnetizing currents cannot flow, therefore complex voltage conditions will exist.

Connection (a) indicates that provision has not been made for the flow of third harmonic current. The secondary side of the connection is shown with the corner of the delta open. A voltmeter connected across this open corner would indicate a 180 cycle voltage. This connection, therefore, can be used to convert from three phase, 60 cycle, to single-phase, 180 cycle.

Connection (b) is the condition when the primary system neutral is connected to the neutral of the bank. This permits the flow of the necessary third harmonic current, resulting in sine-wave voltages which would add up to zero across the corner of the delta. The triple frequency components would return to the source over the neutral conductor.

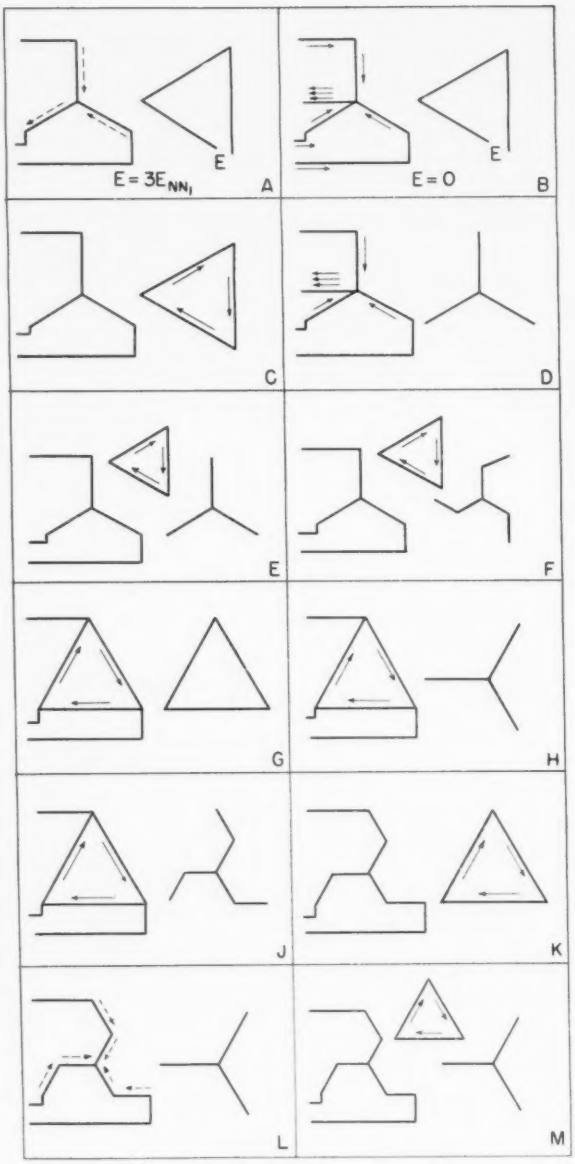
Connection (c) is the one most generally used. In this case the delta is closed and provides a path for the circulation of the triple frequency component. The primary neutral is not necessary and should not be used.

Connection (d) represents a star-star connected bank and indicates that the primary neutral must be available. If the primary netural is not available, a delta, or tertiary winding, must be supplied to furnish the necessary third harmonic components as shown in connection (e).

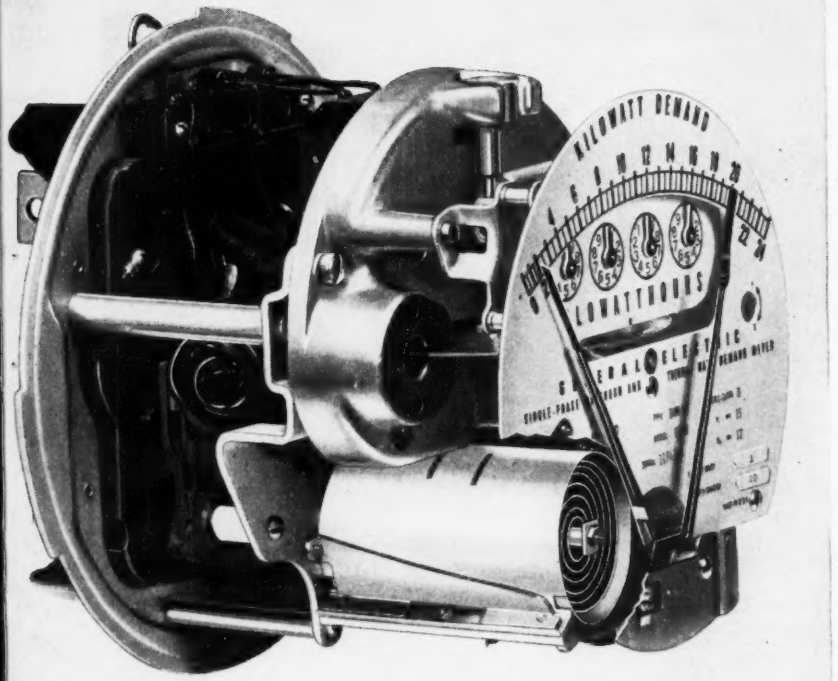
Connection (f) indicates that a delta tertiary winding would be required for a star-zig zag connected bank. This delta winding is only required to produce sine wave flux within the core. If it is not furnished, the phase-to-neutral voltage on the primary side would include a third harmonic voltage. The voltages on the zig and zag parts of the connection would likewise be non-sine wave. The voltages from phase-to-neutral on the secondary side would, however, be sine wave. Because the zig and zag voltages are 120 deg out-of-phase, and the third harmonic components of voltage cancel out.

Connections (g), (h) and (i) cover the conditions when the primary side is delta connected.

Connections (k), (l) and (m) cover cases where the primary side is zig-zag connected. Connection (l) does not permit the flow of the necessary third harmonic current and, therefore, the voltage-to-neutral on the secondary side would be non-sine wave. This can be corrected by installation of a delta winding as in connection (m).



Ampere-turn balance and parallel operation requirements will be presented in Engineering Reference Sheets in future issues.



CUT-AWAY OF TYPE IHM METER SHOWS HIGH-EFFICIENCY "DIRECT-HEAT" SPIRALS.

How G-E Thermal Demand Meters Reduce Your Metering Costs

Reduced maintenance—shorter testing time—less frequent periodic tests possible—these are the ways that G-E Watthour Thermal Demand Meters reduce the metering costs of electric utilities.

LOWER MAINTENANCE COSTS result from the larger, sturdier parts permitted by the high-efficiency thermal demand element. This "direct-heat" unit, with the heat developed in the bimetallic spirals, produces a greater pointer torque, giving higher accuracy with less maintenance.

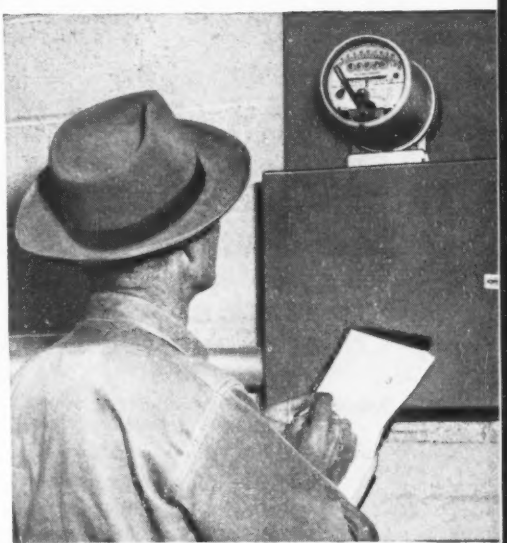
WIDE LIMIT ACCURACY of the watthour meter unit assures highly accurate registration at both high and low loads. Such I-50 features as surge-resistant retarding magnets die-cast into a one-piece aluminum frame help maintain this accurate performance and assure permanent stability.

1 METER DOES 2 JOBS. Type IHM meters measure both kilowatt hours and kilowatt demand, and are ideal for such applications as small industrial, commercial, and large domestic customers. For complete information, call your G-E representatives; or write for Bulletin GEC-1007, General Electric Company, Section 601-88, Schenectady, New York.

GENERAL ELECTRIC

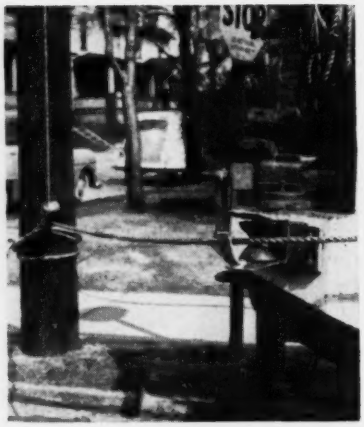
TESTING AND CALIBRATION costs are reduced with IHM meters because desired indication is quickly obtained in test-board overloading.

EASY INSTALLATION is possible because IHM watthour demand meters can be used with standard meter sockets and connection boxes.



ACCURATE READINGS, maximum legibility result from IHM's large scale and knife-edge pointer—designed for easier meter reading.

ROLLER ADAPTER permits curbside hoisting of weighty items without having the truck parked diagonally across the street and impeding the flow of traffic



ROLLER is tilted slightly so line feeds over it properly without riding up and off the edges

Roller at Rear of Truck Aids Hoisting by Capstan

PAUL BENEDICT and F. C. DAUGHERTY, Distribution Dept, The Ohio Power Co, Canton, Ohio

A roller adapter attached to the rear corner of a truck body facilitates hoisting of distribution transformers, circuit reclosers, capacitors and related equipment while the crew is working on busy highways.

When using this accessory the truck can be parked next to the curb to pull the fall-line from various directions with a direct pull on the capstan. This method eliminates the necessity of parking a truck or running a fall-line across busy highways, thus making hoisting jobs much safer than formerly.

The adapter was improvised from a cable roller and has a lip that retains the fall-line until tension presses it against the roller. It can be removed from the truck when not in use since it has a flange which slides into the socket formed by the attachment plate.

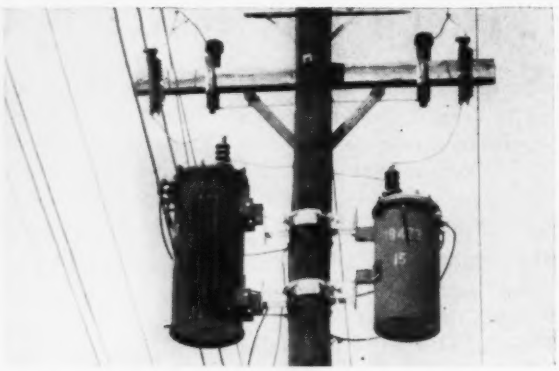
In applying the roller adapter, the following points were given particular attention:

1. Mounting of the roller was made as low as possible on the sturdy portion of the truck that has sufficient strength to withstand the side thrust of the fall-line. This avoids damage to the body or distortion of its alignment.

2. Overturning effect on the truck and hoist load limit were predetermined because the side thrust increases with increased deflection of the fall-line.

3. The truck is always parked so the fall-line is pulled over the outside of the roller rather than the inside as the latter may put too much strain on the adapter and cause a hazard.

COLLAR MOUNTING features simplicity and few parts



NEAT APPEARANCE and weight distribution are other features

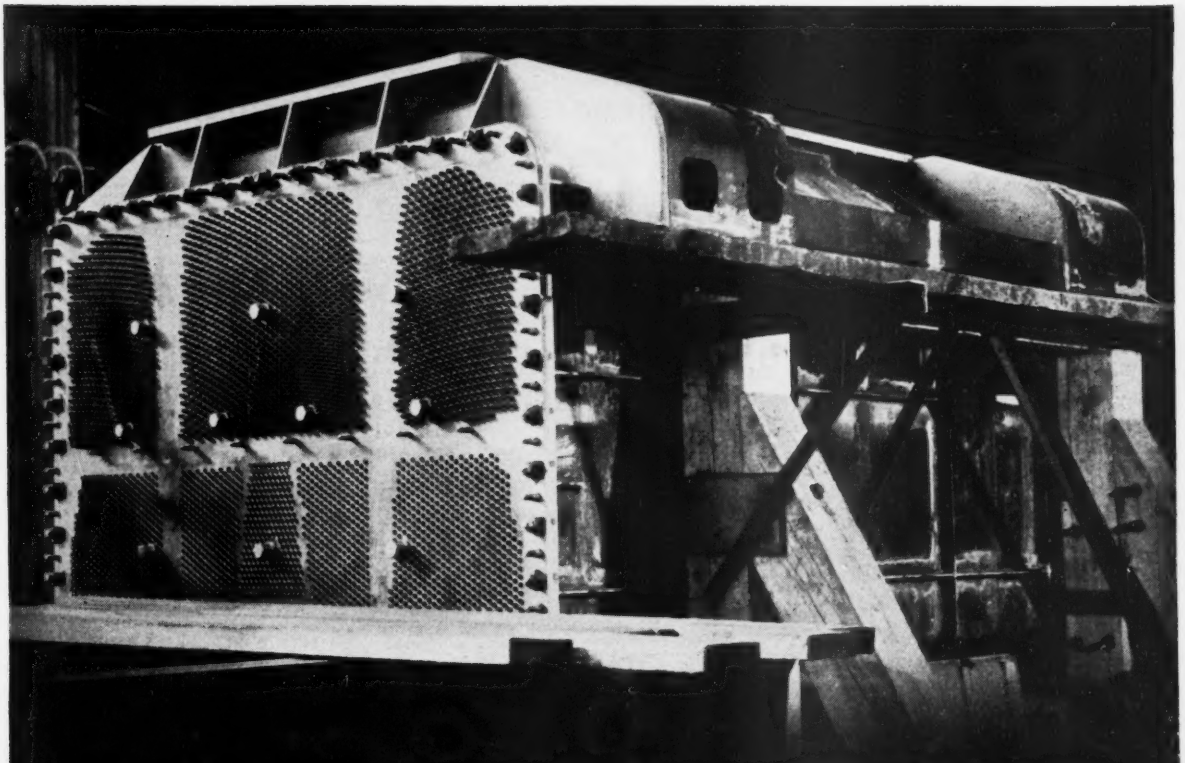
Collar Mounting Simplifies Transformer Installation

S. J. WARD, Superintendent of Substation Construction, Houston Lighting and Power Co, Houston, Texas

Simple low-cost mountings for transformers have been developed by Houston Lighting & Power Company. The bracket consists of a steel collar that fits around any pole size with only two different bracket sizes. Installations are neat appearing and provide ample climbing and working space.

Based on two collars that fit around the pole and are adjustable within fairly wide limits, the design provides

(*Continued on page* 190)



It will pay you as it has paid others to

Specify Revere

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It is significant that year after year important users of condenser tubes and plates specify Revere, not only for new equipment, but when re-tubing. You might consider this fact if you are not as yet a Revere customer.

Remember that Revere can give you more than tubes and plates. If you have questions regarding the most suitable alloy to meet operating conditions, the Revere Technical Advisory Service will be glad to collaborate with you on this subject. If your present tubes do not seem to be giving the service expected of them, the same Service will look into the matter. Such factors as vibration, air entrainment, water velocity, impingement attack, changed water conditions, tube composition, and others will be studied and recommendations made. In a great many cases we have pointed the way to greater tube economy, increased service life.

As part of our service to condenser operators we have prepared a 28-page booklet entitled "Life Extension for Condenser Tubes." Ask for it on your company letterhead and it will be sent free.

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Widest choice . . . *for engineered instrumentation*

EACH of the thousands of industrial processes presents its own peculiar problems of measurement and control. Naturally, no single instrument can solve all of these varied problems. Serious compromises would have to be made in performance, convenience, and cost.

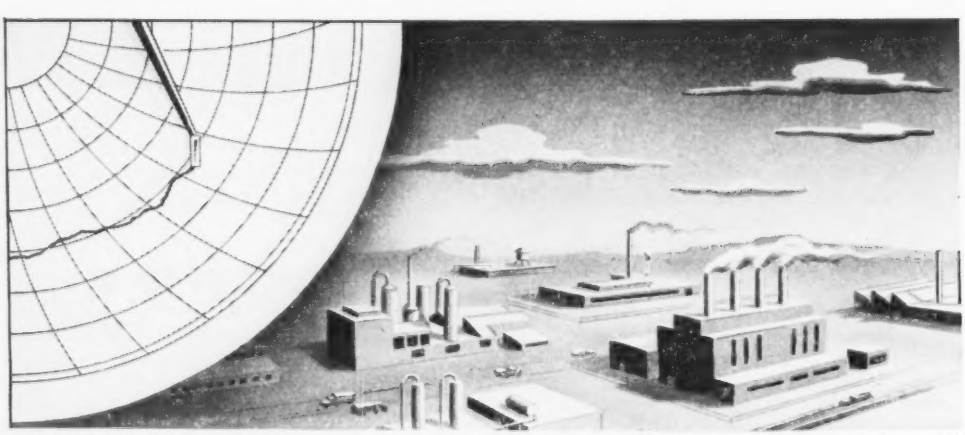
The many Honeywell primary elements, instruments, control systems, and final control elements constitute a uniquely complete family, covering practically the whole spectrum of industrial measurement and control. You can be sure that the combination selected for your job is recommended without bias, and with full consideration for every need of the application.

Included are *ElectroniK* instruments for indicating, recording and controlling a host of variables, in circular and strip chart models; *Tel-O-Set* miniature indicators, recorders and controllers; *Pyr-O-Vane* millivoltmeter controllers; square root and linear flow meters; thermometers; pressure gauges. Electric and pneumatic control systems range from the simplest to the most complex, including fully automatic program control. Primary elements include thermocouples, thermometer bulbs, *Radiamatic* elements, pH assemblies, conductivity cells, flow meter bodies and many others. For final control elements, there is a full range of motorized and diaphragm operated valves. Supplementing these are more than 7000 different non-indicating devices for controlling temperature, pressure, vacuum and other conditions.

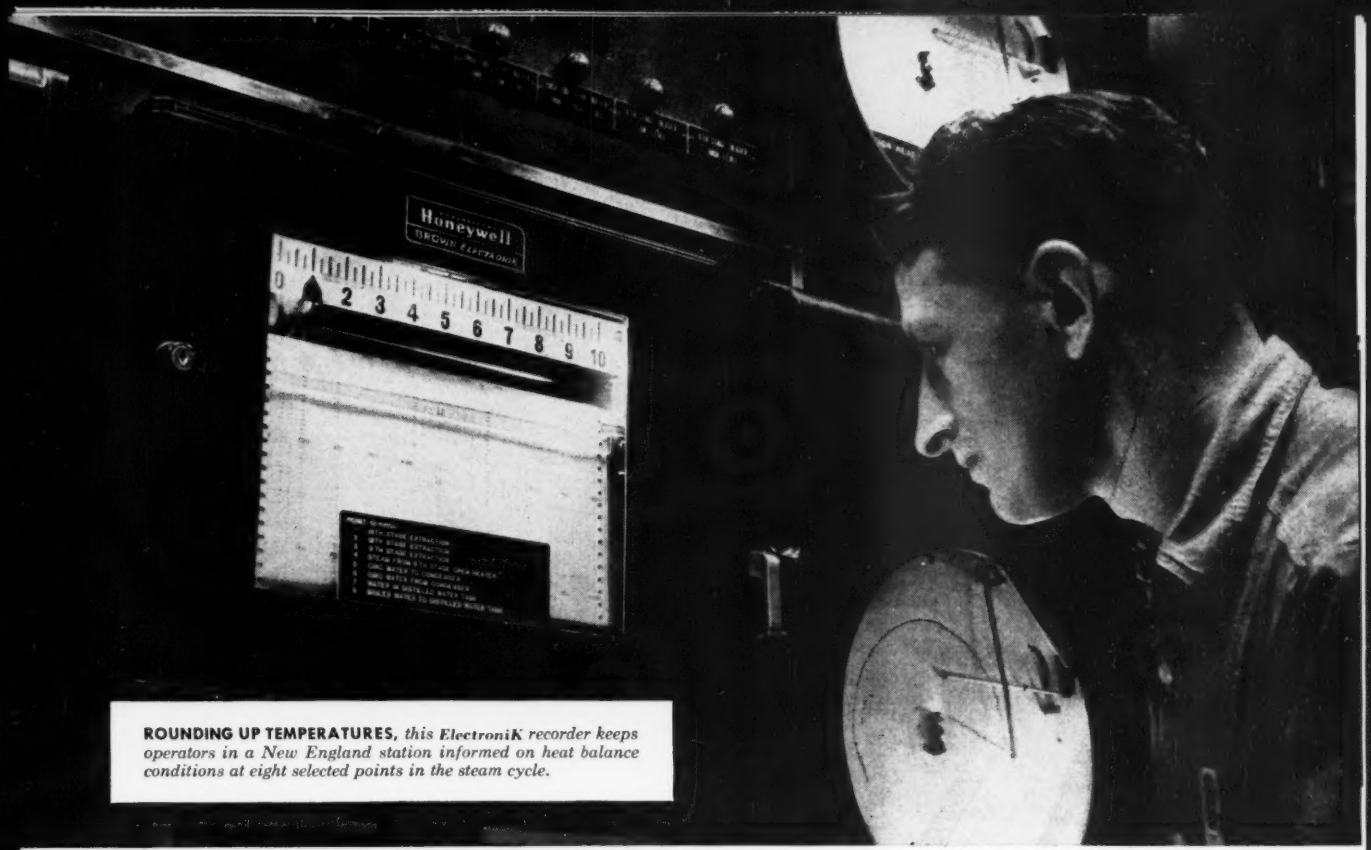
"Building block" approach

These are the building blocks of measurement and control. To combine them into systems custom-fitted to your process, Honeywell offers the know-how gained through years of experience in all branches of industry. Whether your process calls for a single instrument or a complete central control panel, you can be sure of getting the peak in performance and value . . . and the advantages of a single responsibility for the entire installation . . . when you specify *engineered instrumentation by Honeywell.*

Wherever *rely on*



COMPLETE COVERAGE *of industrial requirements for instrumentation is at your command in the Honeywell line. Whatever you need to measure or control . . . to any accuracy . . . with any of a variety of special features . . . you'll find Honeywell instruments offer the most efficient solution.*



ROUNDING UP TEMPERATURES, *this ElectroniK recorder keeps operators in a New England station informed on heat balance conditions at eight selected points in the steam cycle.*

measurement counts...

ElectroniK recorders

FOR ALL the vital measurements that are essential to power plant supervision, you'll get the most in performance with *ElectroniK* recorders. They have every feature that power engineers demand:

They're versatile: the same basic, industry-proved instrument is supplied for measuring temperature, frequency, power, flow, pressure, pH and conductivity. Single and multi-point models are available in a choice of printing speeds and chart speeds . . . readily equipped to operate signals and alarms.

They're accurate: built of life-tested, service-proved components, such as hermetically sealed converters, high-torque balancing motors, and simplified amplifiers. They're unaffected by vibration, atmospheric humidity or dust. They have earned a reputation for staying on the job week after week . . . month after month . . . without interruption.

Behind these instruments stands the largest service organization of its kind, operating from more than 90 offices strategically located in the U. S., Canada, and throughout the world. Ask your local engineering representative for full facts . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* 4568 Wayne Ave., Philadelphia 44, Penna.

● **REFERENCE DATA:** Write for Catalog 90-2, "Supervisory Instruments for Power Generation."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

Collar Mounting

(*Continued from page* 186)

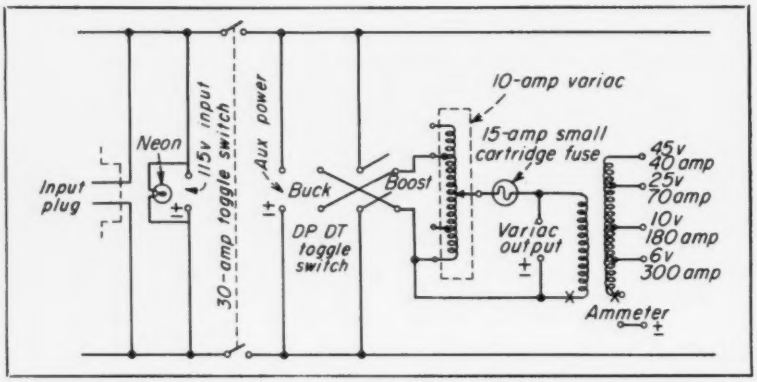
better weight distribution on poles. No holes are drilled in the pole and parts can be completely salvaged. The assembly consists of four parts, an H-bracket and blank for making up the basic unit for mounting up to three 50-kva transformers, and the reinforcing Z and adapter plate for heavier units, up to three 100 kva.

Appreciable savings are effected in both labor and material. Weight of the basic assembly, for three 50-kva units, is only 62 lb whereas the conventional crossarm setup for the same transformers runs approximately 180 lb for steel material only.

The assembly presents a pleasing appearance and allows more pole space for secondaries and drops than other designs.

Where three phase load is served with four wire delta service using two transformers, the collar mounting eliminates the necessity of the lineman trying to balance a large transformer with a small one on the crossarms in order to keep transformers in an upright position.

Transformers are securely bolted to the pole and climbing space is adequate.



LARGE CURRENTS for checking current transformers and relays with high impedance or with high current settings are provided by this unit. It is designed for use in conjunction with a timer previously installed in a set of lower current capacity

Check Current Transformers with High-Current Source

E. D. ANDREWS, System Relay Technician, Idaho Power Co, Boise

To provide large currents for making ratio and polarity checks of current transformers, a current source has been designed that has ten times the capacity of and takes advantage of timing facilties of a lower current test set.* This current source may be used to test relays with high impedance or with high current settings. In addition, when it is desired (for greater accuracy) to apply currents at locations remote from the relays under test, its large capacity allows use of extra long leads. This results in saving much moving of the unit and permitting the operator to work right at the relay.

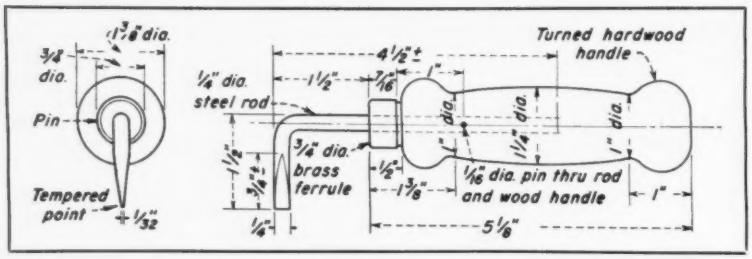
High capacity current source consists of a 10-amp Variac, a 30-amp toggle switch and a transformer with taps providng from 300 amp maximum at 0-6 w to 40 amp maximum at 0-45 v. Variac brush is fused at 15 amp. Studs are provided to energize this unit through the switch on the smaller set, which also starts the timer.

Some of these high-current sets have had multi-conductor plugs added for connection of a portable timer. In these cases the 30-amp switch is used to apply the current and start the timer simultaneously. The set is housed in a steel box that is 17-in. long, 11-in. wide and 8-in. high, and weighs 70 lb.

The transformers were designed and wound in the Idaho Power Co's Transformer Shop, and the remaining work was done in the Engineering Shop.

* See article "Check Overcurrent Relay Elements with Portable Test Set", Electrical World, Dec. 1, 1952, page 118.

Offset Screw Driver Replaces Knife For Opening Splice



TOOL resembles an offset screw driver, and is used for opening automatic line splice

ROBERT E. SCARFF, Electric Distribution Dept., Consolidated Gas Electric Light & Power Co of Baltimore

A simple and effective tool has been designed for opening automatic line splices. It is used to depress the release toggle in the automatic line splice when the splice is to be removed from the conductor. The tool consists of an offset screw driver made of ¼-in. dia steel rod inserted in a turned

Build

all these things and more with versatile UNISTRUT® METAL FRAMING

UNISTRUT framing and pipe clamps support heavy banks of conduit leading to motors in plant of large pharmaceutical manufacturer.

Load center built with UNISTRUT channel and fittings. Framing system's adjustable feature permits quick location of gear to spot desired.

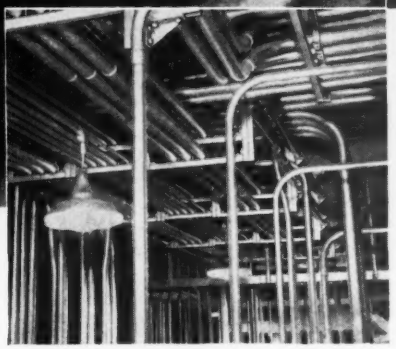
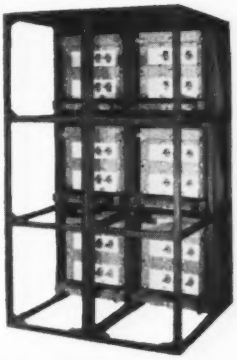


Photo shows how a large power company used UNISTRUT framing and pipe clamps to rack rows of conduit in steam plant installation.

Framework of UNISTRUT channel and fittings support switch gear in typical cubicle installation.



Rack conduit, cable and pipe—
Frame power load centers—
Mount switches, meters and panelboards

Those who use completely adjustable UNISTRUT metal framing know it's easy to handle and quick to erect—that it provides great strength without bulk—that adjustments, changes and additions are easily made at any time.

The UNISTRUT system cuts costs, too. You save time in engineering detailing and eliminate the need for trained erection crews—anyone can build with UNISTRUT channel and fittings. No drilling, no welding, no special tools or equipment—all you need is a hacksaw and a wrench to build wire and cable reel racks, fluorescent fixture supports, transformer vaults, electric motor mounts, bus duct supports and many other structures. It will pay you to try UNISTRUT framing on your next job.

Basic Components of the UNISTRUT Metal Framing System

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1. Reinforce conductors at supports.
2. Minimize wear and chafing.
3. Protect against flashovers and arcing.
4. Provide increased holding power.
5. Absorb and dissipate vibration.
6. Eliminate tie and clamp damage.
7. Increase radiation area.
8. Reduce corona losses.
9. Prolong conductor life.
10. Cut overall maintenance expense.

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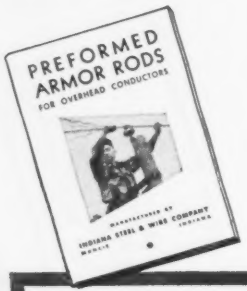
ARMOR RODS

Tightly grip . . . without clamp or clip!

SAFEGUARD CONDUCTORS AT LOW COST!



PREVENT abrasion and chafing of conductors at the supports and you eliminate a major cause of conductor failure. By completely armoring the conductor against wear at these vulnerable points, **Preformed Armor Rods** prolong conductor life . . . help to minimize service interruption . . . keep down repair costs.

Accurately designed and preformed to prescribed length and pitch to perfectly fit the specific conductors or strand on which they are applied, these spiral rods provide a *simple, practical* and *economical* armor protection.

Preformed Armor Rods are quickly and easily applied by hand. Produced in Galvanized Steel, Aluminum Alloy, Copperweld and Bronze.

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Ask your Graybar representative for details!

INDIANA STEEL & WIRE COMPANY
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hardwood handle 5-in. long and 1¼-in. dia.

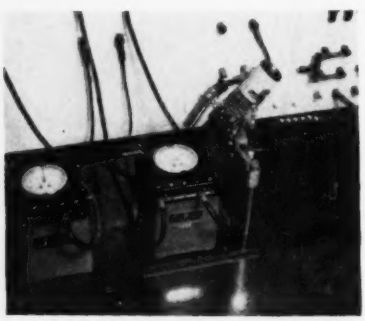
Previously a hook-blade skinning knife was used to depress the toggle. This application was dangerous. To remove the splice a lineman had to hold the splice in the palm of one hand and with the other hand insert the tip of the splice.

A slip could mean a cut hand or a punctured rubber glove. The new tool is more efficient than the skinning knife and eliminates the dangers to the lineman that were previously encountered.

Photoelectric Cell Tests Rotating Standards

E. H. TYSON, Superintendent of Meters, Pennsylvania Power & Light Co. Hazelton, Pa.

Equipment has been developed by Pennsylvania Power and Light Co, so that the photoelectric impulse system of testing can be applied to the checking of rotating standards. In this application, a small mirror is attached to the sweep hand on the rotating standards.



ROTATING STANDARDS on test can be interchanged without readjusting the light and photoelectric cell because of the stand

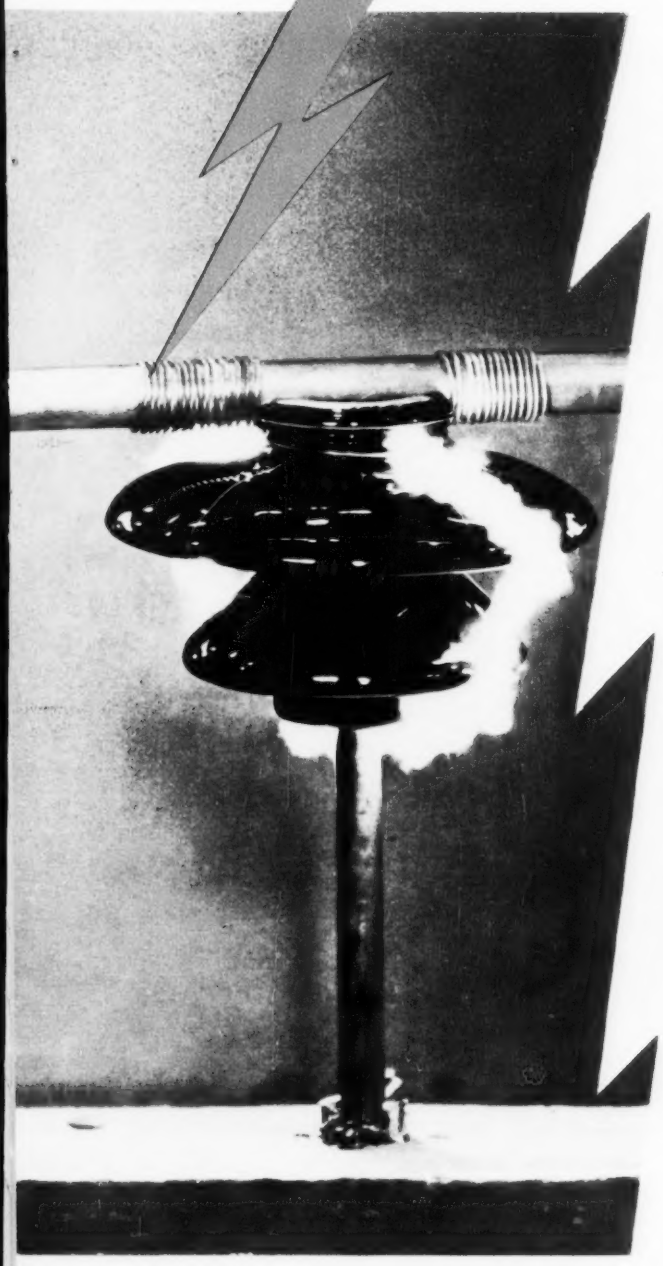
The photoelectric impulse system of testing has a long history of successful application in testing single-phase watthour meters.

Principal innovation in the equipment for testing rotating standards is the stand shown in the center of the accompanying illustration. This device permits the interchangeability of rotating standards without readjusting the light source and pickup cell.

The base plate has indentations into which the rubber feet of the standard are placed. thus insuring that the

(*Continued on page* 197)

HI-TENSION NEWS *Junior*



Portrait of a Lightning Bolt

Here is a photograph and technical comment from the Ohio Brass Barberton High-Voltage Laboratory: "Test of a sample taken at random from stock of Catalog Number 31623. Electrical Data: rate of voltage rise, 8,000,000 volts per micro-second. Time to flashover approximately 0.08 micro-second. Voltage crest before flashover approximately 650,000 contrasted to normal negative critical flashover of 225,000 volts. It is of interest that two simultaneous flashover paths developed on a single voltage application, although it can be observed that several other ionized paths are being established and would also have flashed in another fraction of a micro-second due to excessive piling-up of voltage."

This test simulates a lightning stroke on the conductor adjacent to the insulator. Such testing has been applied to all models of O-B pintypes and, if necessary, design has been amended to make every style highly resistant to lightning puncture. No insulator the size of a pintype can prevent lightning flashover, but realistic testing and careful design can make such an insulator survive a direct lightning stroke.

Briefly, behind O-B pintype insulators is the sincere desire to do a good job -- and also the finest equipment to back up that desire. This accounts for O-B's service records and, in turn, for the loyalty of O-B users.

Are you taking advantage of *all you can get* in pintype insulators today? It's assured when you specify "O-B."

Ohio Brass

MANSFIELD, OHIO, U.S.A.

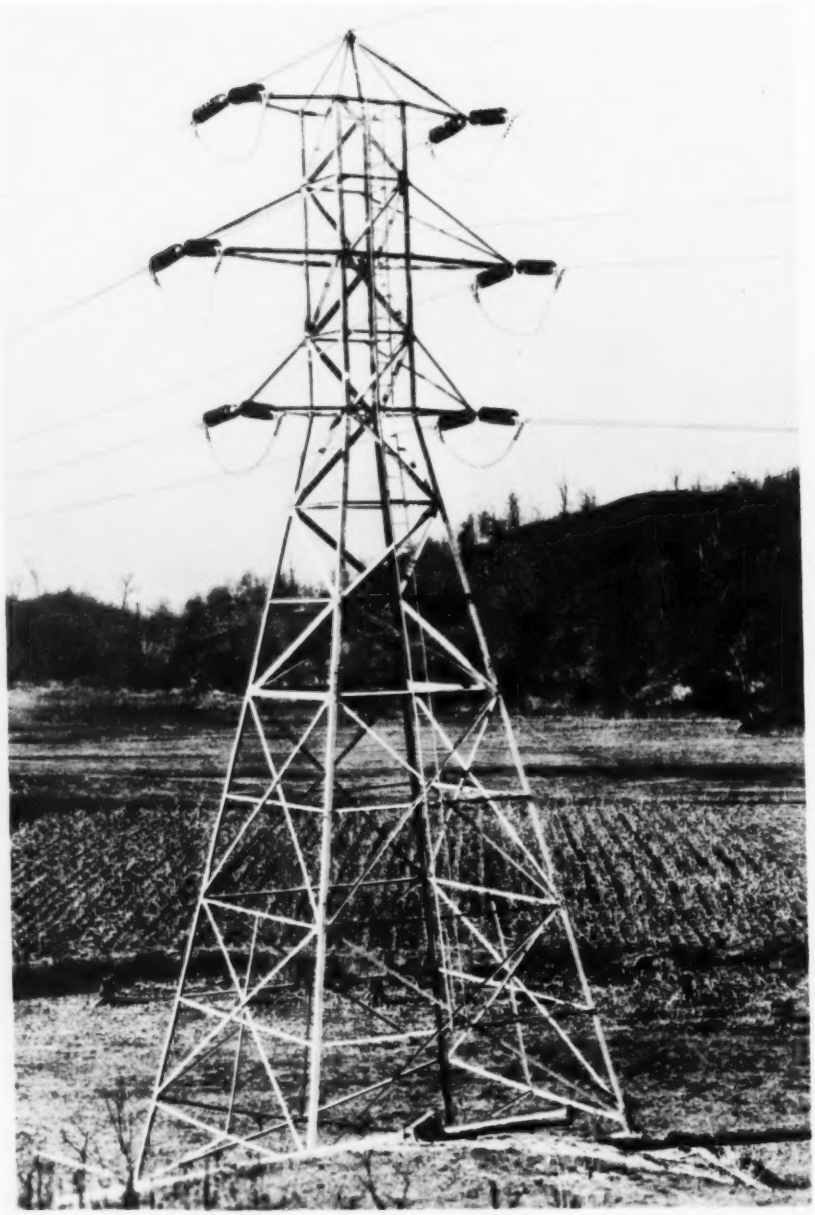
HI-TENSION NEWS *Junior*

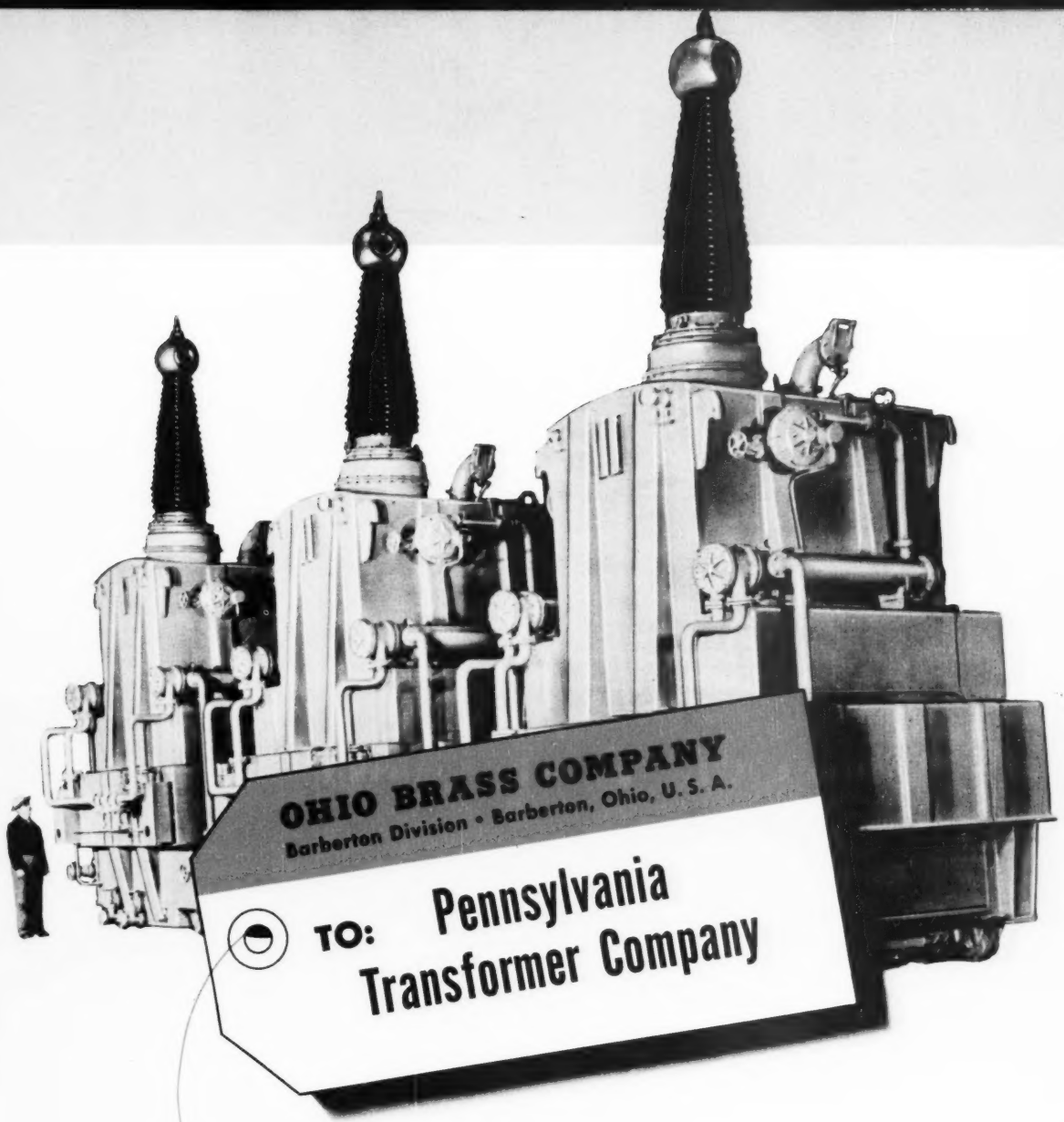
–A Way of Staying off Your Mind

Questioned on the matter of insulator maintenance, the operators of this line termed it "negligible." This is worthy of some note, since the line is just about ready to round out 30 years! It's just one more example of how O-B suspension insulators have a way of staying off your mind.

When you specify O-B, you can forget about insulation from then on -- until newer lines come along where you want to repeat this freedom from trouble. Their reliability is the best reason for making . . .

O-B Your Choice of Insulators





These three large single-phase transformer units have recently been completed and shipped by Pennsylvania Transformer Company. Outstanding features of the apparatus, according to the manufacturer, are: "Rating of individual units, 29,000 kva; three combined, 87,000 kva. High voltage, 230 kv. Low voltage, 13.2 kv. Units cooled by a forced oil -- forced water cooling system. Transformers are of shell form construction and designed for upright shipment on a depressed center car with removal of only bushings and safety valves. Included in the list of factors contributing to long, trouble-free operation are . . . "

O-B BUSHINGS

One of the Finest Components of Any Transformer

Ohio Brass

MANSFIELD, OHIO, U.S.A.

...and one to grow on

Since the growth of power requirements points to the certainty of higher primary voltages, you can forestall the expense and difficulty of revising deadends at some later date by specifying two O-B six-inch insulators at all deadend points -- now! The second insulator installed at the time of original construction will accommodate future load growth by preparing lines for any voltage required later -- up to and including 15 kv.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4225-HR

Photoelectric Cell

(*Continued from page* 192)

standard is always in the same position.

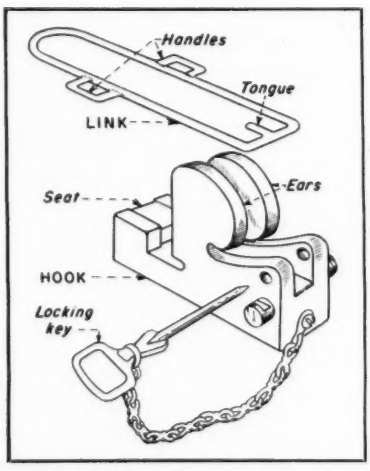
The light cell is mounted in a bracket attached to the housing of the light source and after being once focused, does not require further adjustment.

On the right is the control equipment contained in the former standard case. It consists of the same type of control relays that are used in many similar test systems. Black button in the upper center starts the test. Row of buttons along the top set the number of revolutions. As the sole function of this equipment is to improve accuracy, only one run is taken at a time and the load, voltage, etc, is controlled manually from the test board in the rear.

New Hot Line Tool Makes Deadending Faster, Safer

E. W. BADER, Line Crew Foreman, Idaho Power Co, Boise

Connecting an energized conductor to a straight line deadend is a faster and safer operation through use of a new light-weight hot line tool. Designed to hold the deadend in a rigid position during connection, the tool permits the conductor to be attached



HOT LINE TOOL holds clevis level for easier insertion of conductor into automatic deadend

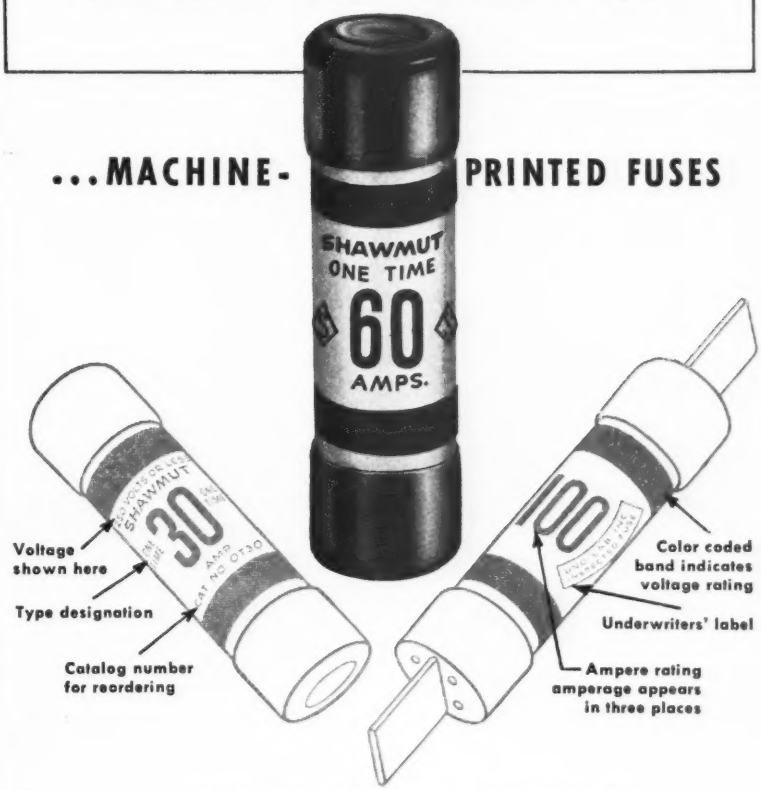
with less difficulty. Furthermore, it reduces the amount of slack left in the line after connection is made.

Tool consists of a rectangular metal link with handles to allow use of a

(*Continued on page* 200)

Another Shawmut First

...MACHINE-PRINTED FUSES



PERMANENT FOOLPROOF IDENTIFICATION

Pioneered by Chase-Shawmut, these modern, machine-printed cartridge fuses give real benefits to those handling them. Old-fashioned, gummed, paper labels are often obliterated or detached by moisture, humidity, dirt, chemical atmospheres, etc. Now, permanent, positive smooch-proof printing right on the fuse itself replaces these old-fashioned labels. Voltage ratings, coded by bright Underwriter-approved colors, and amperage ratings printed in large bold type, have high visibility and are easy to identify on switch-board or shelf, even in dark places. User, contractor and wholesaler alike will appreciate this advantage.

Shawmut's 60 Ampere, Cartridge-Type, One-Time fuses are the first to carry the new printed labels. The 30 Amp. will come next and be followed by 100 Amp. fuses. Eventually the entire Shawmut cartridge line, including *Amp-traps* will be machine-printed.

SHAWMUT LEADERSHIP

The machine-printed fuse is only a minor example of Shawmut leadership in modern circuit protection. Amp-trap, the amazing new current limiter, with Trion and Trionet, the triple protection, low-voltage fuses, are other examples that demonstrate the advanced engineering and design that users, contractors and wholesalers are beginning to look for in all Chase-Shawmut products. Investigate them now. Write today.

REGISTERED UNITED STATES PATENT OFFICE

"Awake At The Switch"

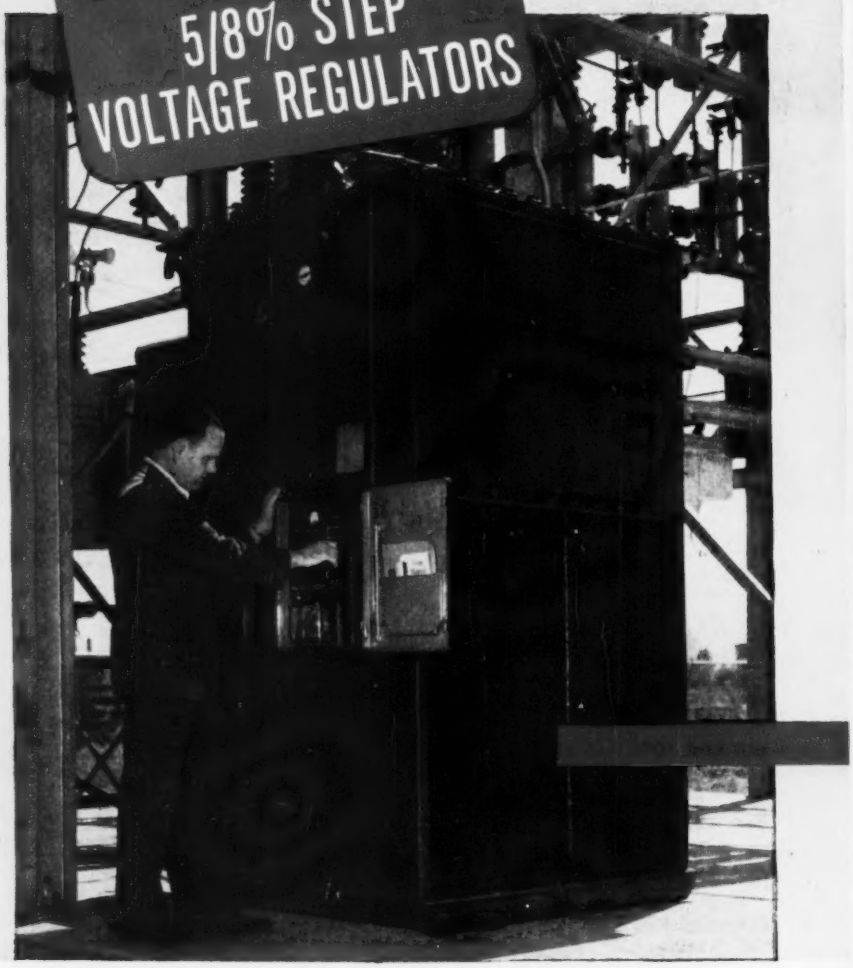
THE **CHASE-SHAWMUT** CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

NOW-20

ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS



You get all the following 32-step type advantages at low cost. Allis-Chalmers distribution regulators offer great new possibilities in bringing accurate voltage regulation to a wide variety of applications. In this low-cost, flexible regulator you get all the advantages of 32-step regulation: a narrow ±1 volt band, 20% range of regulation, long life contacts, the *Feather-Touch* control feature, and unit construction to assure high quality workmanship plus long, trouble-free service.

Ratings available are:
7620 Volts—15, 50, 100 amp
5000 Volts—50, 100 amp
2500 Volts—100, 200 amp

STOCKING POINTS

Speed Allis-Chalmers Regulator Delivery

New program offers faster solution for voltage problems with 5/8% step voltage regulators

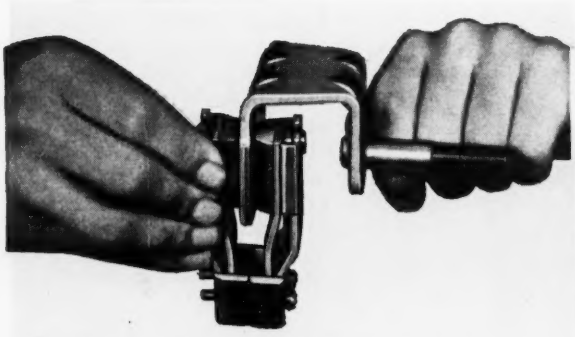
Now, faster than ever before, you can bring the advantages of Allis-Chalmers 5/8% step regulators to your system. Stocks of power and distribution regulators at 20 strategic points throughout the country assure an immediate answer to your voltage problems.

You can eliminate complaints due to low voltage immediately. No more headaches from service calls — A-C 5/8% step voltage regulators give you close, accurate regulation backed by **20 years of 5/8% step regulator experience.**

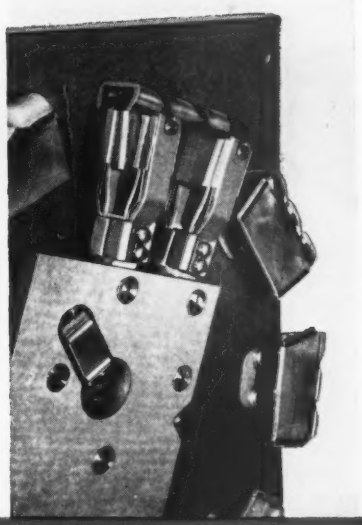
You can correct voltage at low cost without waiting for new construction. If you use Allis-Chalmers distribution regulators you'll have a handy tool for correcting poor voltage elsewhere after new copper is installed. You can shift these units to other lines easily because they are so easy to install.

You can increase profits as soon as you discover that poor voltage is cutting into your revenue. Allis-Chalmers 5/8% step regulators give a narrow ±1 volt band over 20% operating range.

For complete information, call your nearest **A-C** district office or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3931



NO CONTACT WORRIES — you can't pull these contacts apart. One reason they stand up under life tests equivalent to 40 years of normal operation is spring pressure. You get long life without sacrificing tap-changing force or cushioning effect. Other reasons are arc-resistant material plus large, oversize dimensions.



TAP-CHANGING MECHANISM of Allis-Chalmers 5/8% step regulators is designed for simplicity, built for rugged operation. There are only three main mechanical bearings; many parts are combined. Result: life tests show this mechanism will stand up under 5,000,000 operations—equivalent to 100 years of operation.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Originators of 5/8% Step Regulation

AVAILABLE
in 2400 volts

with R T & E's
EXTERNALLY
OPERATED
TAP CHANGER

just a TWIST
of the WRIST
CHANGES TAPS

IN STOCK — AVAILABLE FOR
IMMEDIATE SHIPMENT

WRITE FOR SIZES AND PRICES

EXTERNAL TAP CHANGERS are standard on all sizes at no additional charge — Eliminates opening tank to change taps — Marked for convenience and tap position.

632 N. 8TH ST.
MILWAUKEE 3,
WISCONSIN

R T & E Co.

BRANCH PLANT:
WAUKESHA,
WISCONSIN

Hot Line Tool

(*Continued from page* 197)

hot stick, and a slotted hook with ears and key and chain (see illustration). One end of the link has a tongue which fits over the ears on the hook with the tongue in the slot to prevent the link from rotating and the ears from compressing. Hook is designed so that the ears slip through the opening in the deadend clevis. A rounded-out seat in the hook accepts the clevis barrel. Hook is locked in the clevis with the key.

In operation the hook is placed and locked in the clevis. With one end of the link attached to the block, the tongue end is slipped over the ears. Then the conductor is pulled to position and the end guided through the barrel. After the conductor is secure in the dead end the line is slacked off and the link and hook removed with hot sticks.

Hot line tool may be used wherever a deadend is made with an automatic type of connector.

Bicycle Coil Follows Nonmetallic Ducts

JACK GIBSON, Gibson's Associated Engineers, Fort Wayne, Ind.

To locate and follow nonmettalic ducts and underground cables Gibson's Associated Engineers has developed a detector type instrument.

When using the instrument to follow duct runs, a transmitter coil, connected to a 1,000-cps tone generator, is attached to duct rods and pushed through the duct. The signal, picked up above ground by a bicycle coil, is amplified and can be heard in a set of earphones. Tones of the loudest magnitude will be heard when the bicycle pickup coil is held in a vertical plane, at right angles to the duct and directly above the signal coil.

To follow a buried cable the generator is connected directly to the conductors. The pickup instrument will operate as described above.

The instrument's transmitter coil is the type used in battery telephones and can be obtained at a telephone supply house. Pickup coils can be made by winding 300 turns of AWG No. 24 cotton covered wire around a 25 or 26-in. dia bicycle wheel. The detector's amplifier is a cable fault type.

ICE CAN MAKE A "HOT LINE" COLD

IF SUSPENSIONS CAN'T STAND THE STRAIN!

Purified Porcelain is good insurance against the hazards of winter. This finest insulator porcelain ever made has unequalled ability to stand stress and strain. Cement is specially compounded and caps and pins are scientifically designed for maximum strength. Victor insulators withstand pull of ice, snow, high winds and endure thermal variations far above NEMA standards. For engineering data on these and other Victor *Purified Porcelain* insulators, send for Bulletin No. 4.

Every Victor Suspension Insulator undergoes this routine tensile test before electrical flashover test.

FREE BOOKLET gives you the full story on how Victor Insulators are made—how and why *Purified Porcelain* was developed. Write us for your copy.

VICTOR NO. 900 SUSPENSION

Specify VICTOR INSULATORS!

VICTOR INSULATORS, INC., VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains • Spools • Switch and Bus Insulators • Custom Designed Porcelain

ANOTHER ADVANCE FROM B&W RESEARCH & DEVELOPMENT

Why 26 ELECTRIC UTILITIES B&W pressure-fired boilers

Higher boiler efficiency, lower auxiliary power demands, better operating control, and lower maintenance costs — these are some of the reasons why B&W's pressurized-furnace design is gaining wide acceptance by power companies. At present, 26 electric utilities throughout the country—as well as a number of industrial plants — have in service or on order B&W pressure-fired boilers serving a a total generating capacity of more than 6,000,000 kw. Comprising this total are Radiant, Open-Pass, Integral-Furnace and Stirling units having individual steam capacities ranging between 200,000 and 1,370,000 pounds per hour. Steam-drum design pressures range to 2700 psi and throttle steam temperatures to 1100 F. Fuels include gas, oil and coal—and many units are multi-fuel burning.

Already, several years of intensive operating experience stand behind B&W's pressurized-furnace design. Actual operating units fired with pulverized or crushed coal, including both slag tap and dry ash removal, serve an installed generating capacity of over 1,000,000 kw.

To effect still greater economies in power generation, pressure-firing is often used in combination with various other cost-saving features resulting from B&W's Research and Development program. These include high pressures and temperatures, divided furnaces, cyclone steam separators, gas recirculation, and Cyclone Furnace firing.

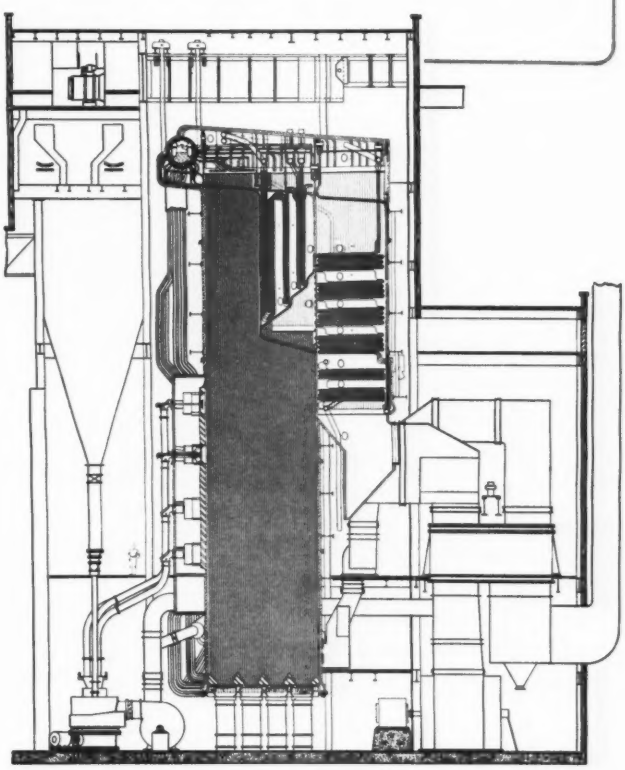
We'll be glad to talk over the details of these features in terms of your company's future requirements. The Babcock & Wilcox Company, Boiler Division, 161 E. 42nd Street, New York 17, N. Y.

BABCOCK & WILCOX

HAVE SELECTED

B&W Pressure-Fired Boilers
For a Total Generating Capacity of
Over 6,000,000 kw

Appalachian Electric Power Company • Arkansas Power & Light Company • Central Louisiana Electric Company • Central Power & Light Company (Texas) • City of Lansing, Michigan • San Antonio City Public Service Board • Commonwealth Edison Company • Consolidated Edison Company of New York, Incorporated • Dallas Power & Light Company • Houston Lighting & Power Company • Indiana & Michigan Electric Company • Jersey Central Power & Light Company • Ohio Edison Company • Ohio Power Company • Oklahoma Gas & Electric Company • Philadelphia Electric Company • Public Service Company of New Mexico • Public Service Company of Northern Illinois • Public Service Company of Oklahoma • Public Service Electric & Gas Company • Southwestern Gas & Electric Company • Texas Electric Service Company • Texas Power & Light Company • Tucson Gas, Electric Light & Power Corporation • West Texas Utilities Company • Wisconsin Power & Light Company

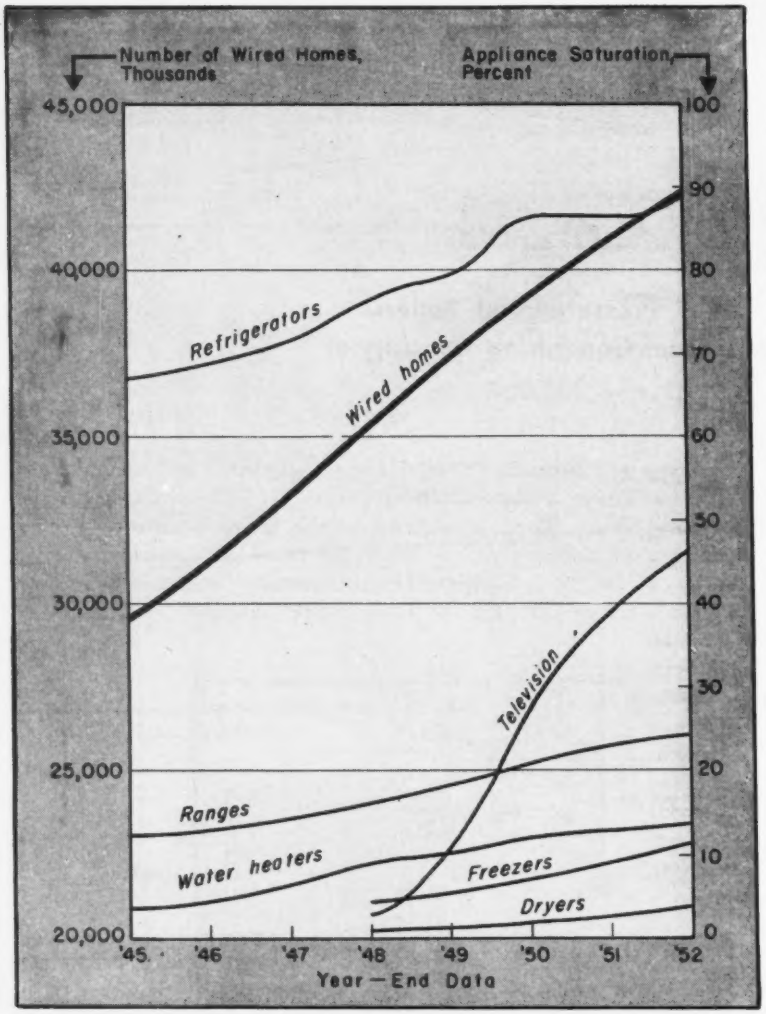


Pressure-Firing, Gas Recirculation, Cyclone Steam Separators, Divided Furnace and Reheat are some of the features of this B&W Radiant Boiler now under construction at a new plant of a leading eastern electric company. Rated steam capacity—1,370,000 lb. per hr. Design pressure—2050 psi. Pressure at superheater outlet—1850 psi. Final steam temperature—1000 F. Reheat to 1000 F.

COST-SAVING FEATURES

1. **Increased boiler efficiency.**
2. **Reduced fan power consumption.**
3. **Lower maintenance costs.**
4. **Greater operating reliability.**
5. **Decreased stack losses.**
6. **Simplified outlet duct and stack arrangement.**

G-5521



SATURATION CHART shows that while refrigerators, ranges, and water heaters lag . . .

Saturation as of Jan. 1, 1953

Product	No. Homes With	% of U. S. Wired Homes
Air Conditioners, Room	560,100	1.3
Bed Coverings	3,628,000	8.6
Blenders, liquefiers	1,474,500	3.5
Broilers	2,813,000	6.6
Clocks	34,248,500	80.9
Coffee Makers	21,570,000	51.0
Dishwashers	1,253,000	3.0
Dryers, Clothes, elec. & gas	1,524,300	3.6
Food Waste Disposers	1,379,300	3.3
Freezers	4,885,000	11.5
Heaters, convector & radiant	9,672,700	22.9
Heating Pads	12,938,000	30.6
Hotplates	8,964,500	21.2
Ironers	3,910,000	9.2
Irons	37,890,000	89.6
Irons, Steam	8,252,000	19.5
Mixers	12,565,200	29.7
Oil Space Heaters	7,260,000	16.0
Radio Receivers	43,720,000	96.2
Ranges	10,200,000	24.1
Refrigerators	37,750,000	89.2
Roasters	3,762,000	8.9
Sandwich—Waffle Combs	13,322,500	31.5
Shavers	13,507,500	31.9
Television	19,751,200	46.7
Toasters	30,000,000	70.9
Vacuum Cleaners	25,145,000	59.4
Waffle Irons	12,231,200	28.9
Washers, electric	32,217,000	76.2
Washers, gas engine	1,298,000	2.9
Water Heaters	5,821,400	13.8

(Radio, oil space heaters, and gas engine washers based on 45,464,000 total homes. All other figures based on 42,306,600 domestic and farm electric customers.)

Post-War Devices Hold Up 1952 Appliance Sales

Dollar volume almost equals 1951, as air coolers, dryers, roasters, space heaters, and television make up for decline in old standbys. Similar selling year expected in 1953

The $6-billion appliance and radio-TV industry just about held its own in dollar volume in 1952, despite a continuation of the 1951 decline in sales of such old reliables as washers, refrigerators, ranges and water heaters. It was a year of selective public enthusiasm for several relatively new devices and a few old ones, an enthusiasm that jumped sales of vacuum cleaners, clothes dryers, freezers, air conditioners, roasters, electric space heaters, steam irons, mixers, television, and others.

Manufacturers who started the year with doubts that there would be sufficient materials and with hopes that first-half demand would not put too great a strain on limited supplies, discovered before spring that once again, as in 1951, they could produce more of many things than the public could absorb.

Refrigerator makers, for example, found their new models extremely difficult to move and some even returned to producing 1951 models, which they could offer as "specials" at reduced prices, in order to keep sales moving constantly.

It was this kind of sales atmosphere which, says *Electrical Merchandising* was responsible for refrigerator sales of 3,570,000 units, off 12.4% from 1951 in units, 9.2% in dollars. Ranges, with sales of 1,060,000 units, were off 24.3% in units, 22.8% in dollars. Water heaters nearly duplicated the 1951 decline with sales of 720,000, off 14.8% unitwise (off 14.6 in 1951) and 16.7% dollarwise. Ironers proved once again that they require special sales effort with sales of 207,500, off 26.9% in units, 12.5% in dollars.

Some Important Gains . . . The most startling gain among major appliances was registered by room air conditioners. These, with a 1951 increase of 28.7% already in the record, jumped

This is how unit sales and values of appliances compare for 1951 and 1952

	1952		1951	
	Units	Retail Value	Units	Retail Value
Air conditioners, room	341,000	$122,760,000	237,500	$86,687,500
Bed coverings	830,000	35,275,000	776,000	32,980,000
Blenders	425,000	17,637,500	290,000	11,455,000
Broilers	434,700	13,172,100	312,000	7,200,000
Cleaners, Vacuum—				
Floor type	2,855,000	261,289,600	2,729,100	234,893,600
Hand type	153,000	4,720,000	176,000	5,313,500
Clocks	6,700,000	48,575,000	7,500,000	52,125,000
Coffee makers	3,000,000	60,185,500	2,825,000	59,409,750
Dehumidifiers	90,000	12,870,000	75,000	10,875,000
Dishwashers, motor-driven	210,000	63,000,000	260,000	78,000,000
Dryers, clothes, elec. & gas	610,000	157,100,000	492,000	120,679,500
Fans, all types	2,635,000	87,994,500	3,125,000	89,173,000
Food waste disposers	275,000	35,750,000	352,000	47,520,000
Freezers, home	1,140,000	421,800,000	1,050,000	378,000,000
Fryers, deep fat	1,250,000	37,437,500	725,000	20,662,500
Heaters, electric space	1,202,000	31,203,000	930,000	12,393,000
Heating pads	1,500,000	10,425,000	1,450,000	10,077,500
Hotplates	905,000	8,597,500	940,000	8,695,000
Ironing Machines	207,500	43,367,500	283,840	49,572,700
Irons, all types	6,135,000	95,203,250	7,585,000	104,166,800
Lamp bulbs & Tubes, total	1,838,000,000	484,000,000	2,012,132,000	518,100,000
Fluorescent	75,000,000	85,500,000	86,652,000	102,600,000
Incandescent	900,000,000	217,500,000	950,408,000	228,000,000
Photo	350,000,000	65,800,000	295,848,000	51,000,000
Miniature	340,000,000	96,000,000	415,624,000	107,500,000
Christmas tree	173,000,000	19,200,000	263,600,000	29,000,000
Mixers, food	1,730,000	67,227,250	1,600,000	68,000,000
Radios, home	3,601,770	123,360,600	6,751,400	231,235,500
Radios, portable	1,367,310	42,386,600	1,332,990	41,322,700
Radios, clock	1,630,300	64,396,800	777,000	30,691,500
Ranges	1,060,000	270,300,000	1,400,000	350,000,000
Refrigerators	3,570,000	1,017,450,000	4,075,000	1,120,625,000
Roasters	460,000	18,377,000	442,000	18,541,900
Shavers	2,550,000	63,622,500	2,200,000	53,900,000
Television	6,000,000	1,691,988,000	5,384,800	1,658,500,000
Toasters, total	2,991,700	63,178,850	3,725,000	75,763,700
Waffle irons, sand. grills	1,570,000	32,165,500	1,875,000	33,656,300
Washing machines, total	3,217,800	689,118,300	3,488,400	720,790,400
Electric,(standardsize)	3,145,000	685,574,400	3,384,700	715,663,000
Gas engine	8,800	1,415,900	12,300	1,961,300
Small	64,000	2,128,000	91,400	3,166,100
Water heaters, storage	720,000	95,040,000	845,000	114,075,000
Water systems	680,000	110,160,000	625,000	96,875,000

ahead 42.7% more in units and 40.7% in dollars to make a total of 341,000 sales and $122,760,000. Not so startling, but more important to utilities, was the record of clothes dryers. Electric models made a unit increase of 24.3% to total 440,000; gas models gained 23.2% for total sales of 170,000. Total sales of both types went ahead 24% in units, 30.2% in dollars for figures of 610,000 and $157,100,000, respectively.

Freezer sales, which logically might have been expected to follow dishwashers and refrigerators down, got a transfusion from the fast-spreading food plan boom and made an 8.6% increase in units, an 11.6% gain in dollars to total 1,140,000 units, $421,800,000.

Jagged Profile . . . The uneven pattern of 1952 sales could not be attributed to any great change in the number of dealers. According to the 192 continental U. S. power companies reporting to *Electrical Merchandising*, there were 77,400 dealers serving their territories. The 167 of these utilities who made reports for both 1951 and 1952 found less than 1% gain in the latter year. More important reasons why the 42,306,600 farm and domestic electric customers bought as they did were the saturation of postwar need for such items as refrigerators and a high personal income which encouraged the purchase of newer appliances with either great use value (such as the clothes dryer) or fad appeal (such as the open-face broiler).

By January, 1953, refrigerator saturation stood at 89.2%. Washers, with an acceptance of 76.2%, still had a long way to go, because of the popularity of automatic models which, for the first time in history, outsold conventional types in 1952 in both units and dollars. This new appeal of the washer, incidentally, is emphasized by the fact that the 246 dealers responding to *Electrical Merchandising's* replacement and trade-in survey say that 73% of washers went into homes as replacements, a figure which represents nearly a 10% gain over the previous year. Even television has reached the point where replacement sales begin to figure importantly. Responding dealers say 35.5% of all TV sales in 1952 were replacements, a substantial jump over the 12.3% reported for the previous year. Total range sales for the year were off and the difficulty of moving ranges into customers' homes is emphasized by the fact that 44.2% of 1952 sales were replacements as compared with 35% in 1951. Freezers, on the other hand, benefitting from awakened public interest, were replacements in only 7% of sales, a decline from 1951's 10.2%.

For 1953, More of the Same . . . The industry goes into 1953 with one big advantage over 1952: clean inventories. It took many months, and a lot of price cutting, but this year retailers are in a good inventory position. Also on the credit side of the outlook are some radically new appliances, unrestrained production, the rapid opening of new television markets, and the probability of continuing high consumer incomes. Prominent on the debit side is the continuing struggle for supremacy among manufacturers, a battle which often manifests itself in market-flooding and resultant price-cutting, and which will probably be intensified during the year.

But, by and large, the industry can look forward to another $6-billion year.

This is how the appliance market breaks down

	Residential & Rural Electric Customers	Shipments by Percent of U. S. Total, 1952							
	Jan. 1, 1953	% of U. S. Total	Washers 8 mos.	Ironers 8 mos.	Dryers 8 mos.	Refrigerators 9 mos.	Ranges 9 mos.	Water Heaters 9 mos.	Freezers 9 mos.
New England	2,833,733	6.70	6.26	4.89	4.15	5.51	6.84	5.69	2.62
Middle Atlantic	8,616,840	20.37	18.34	21.00	18.84	20.34	13.32	15.53	13.57
East North Central	8,854,844	20.93	19.78	29.48	35.48	18.56	17.11	20.49	17.46
West North Central	4,074,038	9.63	8.33	10.60	12.53	8.59	7.94	10.80	13.49
South Atlantic	5,425,511	12.82	14.65	8.95	5.42	16.53	24.50	26.99	12.79
East South Central	2,689,426	6.36	6.64	2.26	1.88	7.79	11.78	7.49	6.16
West South Central	3,767,236	8.90	9.99	6.22	2.77	10.52	4.05	1.93	11.22
Mountain	1,439,220	3.40	3.56	4.33	3.18	2.94	4.48	4.22	5.75
Pacific	4,605,750	10.89	12.45	12.27	15.75	9.22	9.98	6.86	16.94
United States	42,306,598	100%	100%	100%	100%	100%	100%	100%	100%

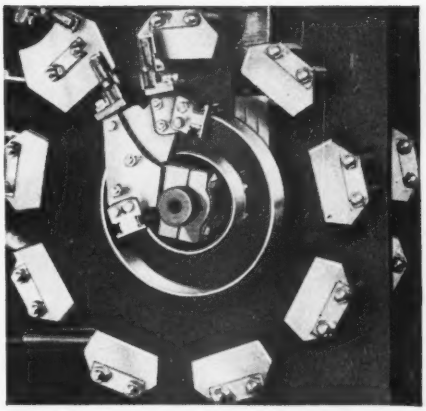
In the last 2 years
OVER 1,000,000 KVA
additional capacity regulated
by Moloney Load Tap Changers
MOLONEY
ELECTRIC

MOLONEY LOAD TAP CHANGERS

Offer these advantages for feeder voltage regulators, regulating transformers and load ratio control transformers

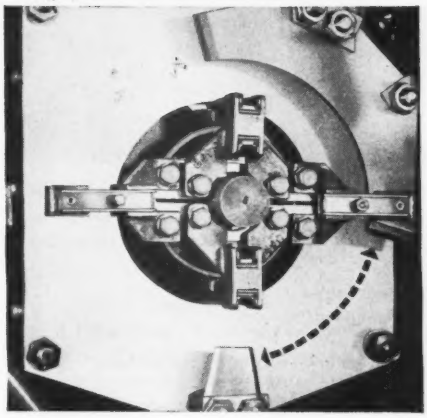
ELECTRICALLY

No arcing duty is imposed upon any of the tap selector switch contacts, avoiding the necessity for replacement due to burning or scoring. A separate switch is used for breaking load current, and a reactor in parallel with this switch during each opening and closing keeps arcing here to a minimum. Virtual elimination of arcing not only prolongs the life of the contacts but also preserves the quality of the oil in the tap changer compartment.



MECHANICALLY

The load transfer switch, which is the only switch required to transfer load current, is provided with accelerating springs and is driven by Geneva gears. The design provides a means of opening and closing the load transfer switching elements at a high rate of speed without shock to the gearing or other parts. Moloney Load Tap Changers have been inspected in the field after more than 500,000 operations and have been found to have no mechanical wear sufficient to require replacement of parts other than contacts.



MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MEB2-23

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

DOW

CLEAN POLES MAKE FAST FRIENDS

PENTA builds good customer relations

PENTA pressure treated Southern Pine poles installed in the Chicago area.

The Dow Chemical Company
Dept. PE 3-281. Midland, Michigan

_____ Send me free booklet, "Pointers on Penta."

_____ Send me list of PENTA treating plants.

_____ Please have technical representative call.

Name_____Title_____

Company_____

Address_____

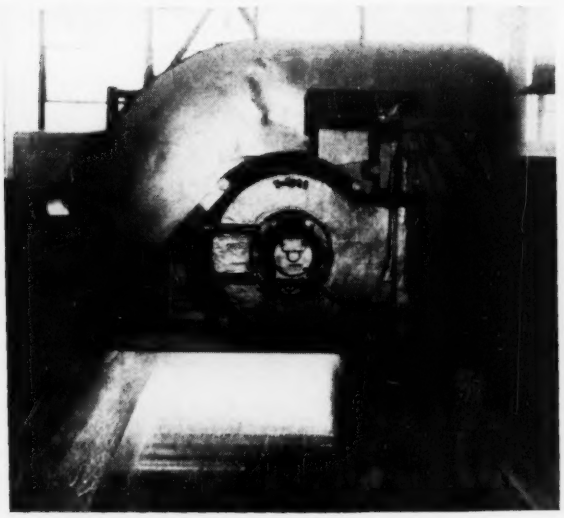
City_____State_____

Poles treated with *clean* PENTA* are being placed in many new residential areas by the Illinois Bell Telephone Company. They are playing their part in this company's far-sighted customer relations program. *Clean* full-length PENTA treatment for poles and cross-arms reflects sound management. Since PENTA lengthens wood life many times, it cuts repair and maintenance costs to save you money. Poles treated with PENTA are clean and easy to handle—a modern method of wood treatment for modern settings.

Specify *clean* PENTA treatment for all your wood preserving needs and be certain of lower maintenance costs—better customer relations. Write Dow today for information about *clean* *PENTAchlorophenol. THE DOW CHEMICAL COMPANY, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW



STRUCTURAL SHAPE being cut by high speed circular friction saw. Only a few seconds are required to cut heavy I beams. No clamping or change in machine setup is required

CONTROL DESK for friction saw is mounted so as to give operator full view and full control of cutting operation. Main motor drive is started and saw is brought up to speed before any cutting is attempted

Friction Saw Cuts Steel Faster: 15 Seconds Required for Heavy, 30-in. Beams

L. J. LANGEVIN, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio

A high speed friction saw has increased production many times in the steel-service plant of Joseph T. Ryerson & Son, Inc., Cincinnati, Ohio. It is claimed to be the fastest known means of cutting heavy structural shapes, I beams, H sections, channels, angles, etc., all of which are cut in a matter of seconds without clamping the material or changing the machine setup. The heaviest 24 in. beam can be cut in 13 sec and a 30 in. standard beam can be cut in 15 sec.

Electrical Equipment . . . The circular friction saw is driven by and mounted on the shaft of a special squirrel cage induction motor. It is rated at 200 hp, 1,720 rpm, 480 v, 237 amp, 3 phase, 60 cycle.

The control equipment is a reduced voltage, auto transformer, magnetic type, 2-step starter with adjustable time between steps. Due to the large (WR^2) flywheel effect of the friction saw and motor, it is necessary to set the timing relay at a long enough interval so as to limit the inrush current when the starter switches the motor from the reduced voltage tap to full voltage.

In addition to the electric saw motor, there is a pump motor mounted on the saw carriage. It drives the coolant pump. The operator's electric control panel is mounted so as to give the operator a full view and full control of the cutting operation.

Operation . . . In the sawing operation, the electrical energy is converted into mechanical energy by the electric motor and the mechanical energy is stored in the friction saw which has very considerable flywheel effect. Due to the friction between the saw and the steel being cut, the mechanical energy is converted to heat very rapidly and the steel is brought up to the melting temperature and the saw teeth remove the hot metal with ease.

The main motor drive is started and the saw is brought up to speed before any cutting is attempted. An electric tachometer is used to indicate the speed attained by the saw before cutting is attempted.

The steel saw blade is 5 ft 2 in. in diameter and ⅝ in. thick, has milled teeth, and attains a peripheal velocity of 27,800 ft per min. The teeth of the friction saw are cooled by a coolant which is sprayed on to the teeth under pressure.

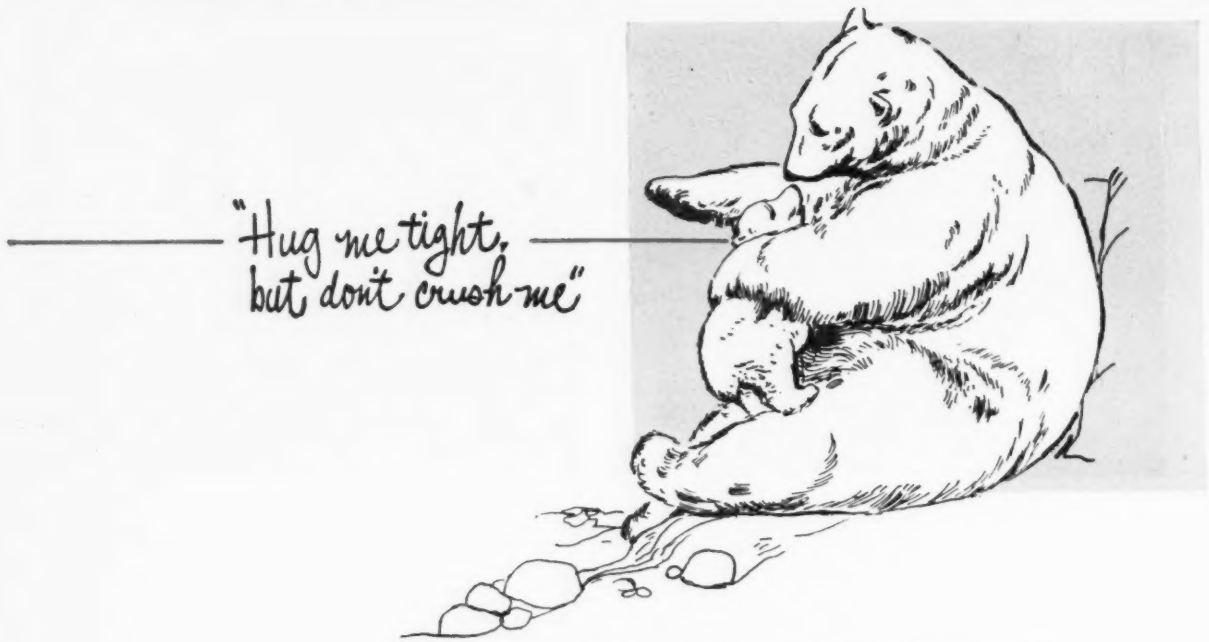
Control . . . Motor driven rolls bring the structural shape into position for cutting. By means of forward and reverse inching buttons, the operator can position the steel to cut any exact length required. A visual indicating gauge shows the operator the length of the piece which will be cut off.

The steel is not clamped in place, but is placed alongside of a sideguard which keeps it from moving laterally while being cut. The saw itself prevents longitudinal motion.

The saw carriage is operated hydraulically and the rate of feed is regulated by adjusting the hydraulic pressure. In this manner, the pressure of the friction saw on the piece of steel being cut is varied. By increasing the pressure, the cutting speed is increased. The hydraulic pressure is obtained by means of an electric motor driven pump.

The operating pressure is selected so as to allow sufficient cutting speed to give a clean cut without burring, and yet limit the electrical cutting peaks to approximately 200% of the full load rating. It is usually desirable to utilize the highest possible cutting speed as cleaner cuts can be obtained at higher speeds.

UNIFORM LOW-PRESSURE,



That little bear has nothing to worry about. Powerful as his Mother is, those huge paws hold the small cub firmly, but with no dangerous pressure. He is fully protected from all natural dangers.

Neither will you have to worry about your conductors if Preformed Armor Rods* are used for (1) Repair Armor (2) Splices (3) Dead-Ends (4) Hot-splice Shunts and (5) SUPPORT ARMOR UNDER SUSPENSION CLAMPS, STOCK-BRIDGE DAMPER CLAMPS; HOT-LINE TAPS, SPLIT-BOLT CONNECTORS OR ANY OTHER CLAMPING DEVICE.

Preformed Armor Rods eliminate any possibility of concentrated high pressures that may cause cold flow of soft conductor metals. There can be no "locking or freezing" of conductor strands under the free ends of Preformed Armor Rods. Your conductor is efficiently protected against vibration fatigue; chafing, abrasion, arcing, slippage and LOOSENING of hardware accessories.

Preformed Armor Rods are the only means of obtaining the UNIFORM LOW-PRESSURE LARGE-AREA CONTACTS that are proving so important in lengthening the life of conductors, particularly aluminum.

For an up-to-the-minute memorandum on this whole subject by Mr. T. F. Peterson, write Preformed Line Products Co., 5349 St. Clair Ave., Cleveland 3, O.

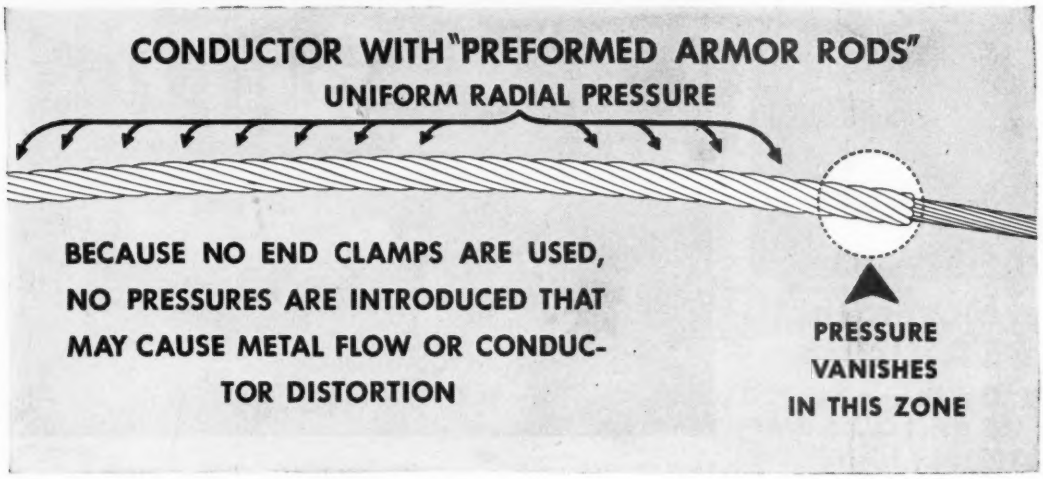
**Preformed Armor Rods are manufactured under Patent No's 2,275,019 and 2,587,521 . . . other patents pending.*

PLP

PREFORMED

LARGE-AREA CONTACTS

Eliminate Concentrated High Pressures


CONDUCTOR WITH "PREFORMED ARMOR RODS"
UNIFORM RADIAL PRESSURE
BECAUSE NO END CLAMPS ARE USED, NO PRESSURES ARE INTRODUCED THAT MAY CAUSE METAL FLOW OR CONDUCTOR DISTORTION
PRESSURE VANISHES IN THIS ZONE

IN ADDITION:

1. **Lower suspension clamp temperatures** are assured because Preformed Armor Rods add extra metal to the conductor within the suspension clamp. The greater electrical conductivity naturally reduces I^2R losses.

2. **Preformed Armor Rods never loosen.** Made of high-strength, spring-quality metals, these rods are elastically sprung onto the conductor. This principle has also been incorporated into PLP Dead-Ends and splices.

3. **Conductor chafing is practically eliminated** because vibration stresses are distributed more evenly. What little abrasion occurs, takes place on the tough armor rods rather than on the soft conductor.

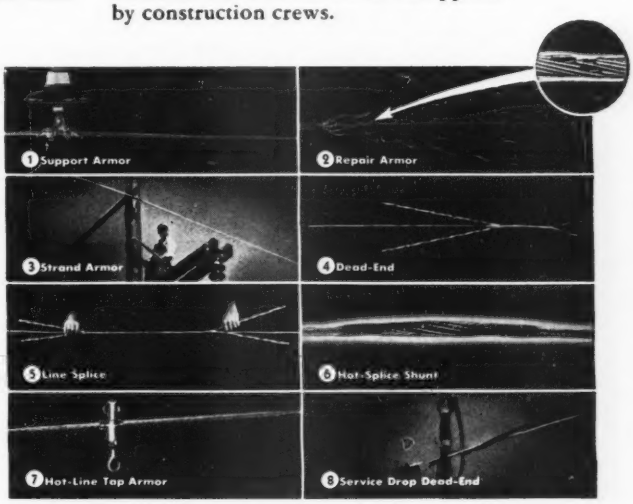
4. **Factory control of** Preformed Armor Rod dimensions guarantee uniformity of field installations. The rods are "factory-fitted" for the particular conductor and cannot be misapplied by construction crews.

There is no question that ALUMINUM CONDUCTORS are here to stay. BUT, connecting and supporting ALUMINUM CONDUCTORS to assure maximum life require new types of clamp supports, splices, dead-ends, tap connections and service-drops.

The efficient and economical answers to these problems . . . not only for Aluminum Conductors, but also for ALL TYPES OF CONDUCTORS . . . are the PLP products shown here.

For details of their exclusive advantages, write or . . .

TELEPHONE CLEVELAND: EXpress 1-3571



LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE

CLEVELAND 3, OHIO

Every Movement has a SAVINGS of its own . . . . .

SAVE UP TO 75% of MATERIALS HANDLING COSTS WITH

HEAVY-DUTY FORK
LIFTRUK
OR
LIFT-O-KRANE

Leading Public Utilities find these heavy-duty, rugged SILENT HOIST machines dependable and efficient for the continuous, complex requirements of the transportation department, storage area, repair shop . . . in the movement of Generators and other heavy equipment, Cable, Wire, Maintenance Supplies, Poles and general equipment.

The LIFTRUK *Fork Lift Truck* and LIFT-O-KRANE *Combination Crane and Fork Lift Truck* handle capacity loads with maximum stability and safety. They have high lifting range. Make short turns in narrow spaces. Promote maximum efficiency for storage areas . . . and effect rapid inloading and outloading, with economic use of manpower.

Send for Bulletin 77 for LIFTRUK. Bulletin 75 for LIFT-O-KRANE

Makers of KRANE KAR Mobile Boom Crane, KARRI-GO Front Boom Crane, SILENT HOIST Cranes for Motor Truck Mounting, SILENT HOIST Winches and Capstans, SILENT HOIST Hydraulic Telescopic Truck Towers, etc.

SILENT HOIST & CRANE CO.
Pioneer Manufacturers of Heavy-Duty Equipment for Public Utilities and Municipalities
862 63rd STREET, BROOKLYN 20, N. Y.

Thermo Ray Corp

RADIANT HEAT panels on walls and doors of oven provide accurately controlled and uniform heat for melting wax in molds. Weekly fires and explosions, experienced with former gas fuel, have been entirely eliminated

Electric Oven Eliminates Fire Hazard

Electric radiant heating panels in an oven used for melting wax in molds, has completely eliminated fire and explosions which formerly occurred every week when gas fuel was employed at Perfect Casting Co, Brooklyn, New York. Temperature is more uniform, control is more accurate and better castings are produced. According to Samuel Rubino, president of the company, there is no noticeable change in the fuel bill. Working conditions are more pleasant for employees.

The company produces industrial castings and dental instruments. Castings are made with the "lost wax" process which is very wasteful if too much of the wax is "lost."

Oven has eight heating panels with a total load of 4500 w at 230 v. Six panels are installed on the walls and doors. They are backed by aluminum sheets which serve as heat ray reflectors. There is an air space between the panels and the reflectors. Two heating panels are mounted under the trough which collects the wax.

An air space in the front of the oven induces an inflow of cold air at the bottom, through natural draft. A vent, in the top of the oven, exhausts fumes without a fan being necessary. Oven is completely insulated with 3 in. blocks.

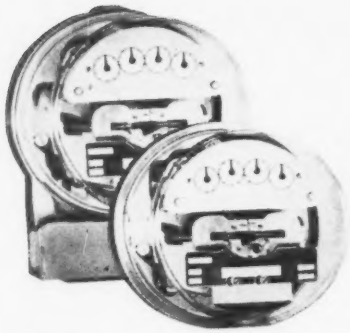
Fifty-four cylindrical molds are loaded into the oven at a time, and are heated for 4½ hr at temperatures ranging from 200 to 220 F. They weigh 11 lb each and contain ethyl silicate, alcohol, water, sand and wax patterns. A thermocouple inside connects with the thermometer dial on top of the oven.

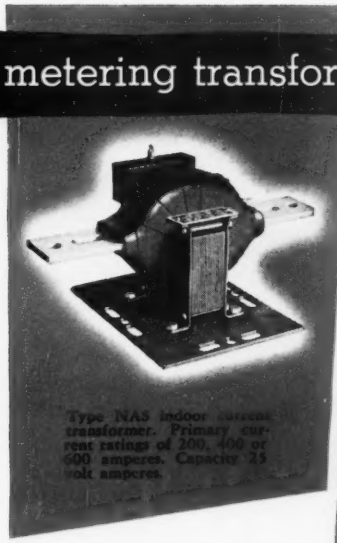
INDUSTRIAL BRIEFS

Unloading sawdust and shavings from freight cars by vacuum tube conveyor is accomplished in one-half time and with one-half manpower required by former belt conveyor method at Ground Wood Products Co, Cincinnati, O. Several kinds of sawdust and shavings are unloaded into separate storage bins, then fed through closed conveyors to a hammer mill, attrition mill, sifters, and bagging room. Five separate buildings house the all explosion-proof equipment. Electric service is 480-v, 3 phase, 60 cycle, and mill motors are 3600 rpm direct connected. Blower motor is 20 hp. The "wood flour" product is sold to the paper industry for felt manufacturing, metal working plants for removal of oil by tumbling, fur cleaning, as a base for molded plastics, meat

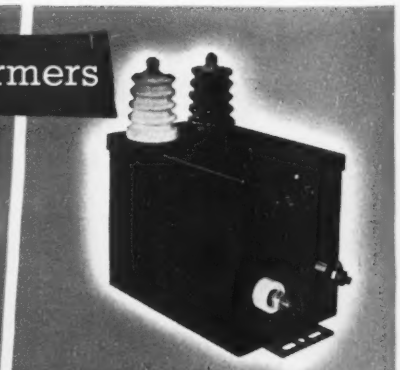
(*Continued on page 216*)

current, potential and metering transformers

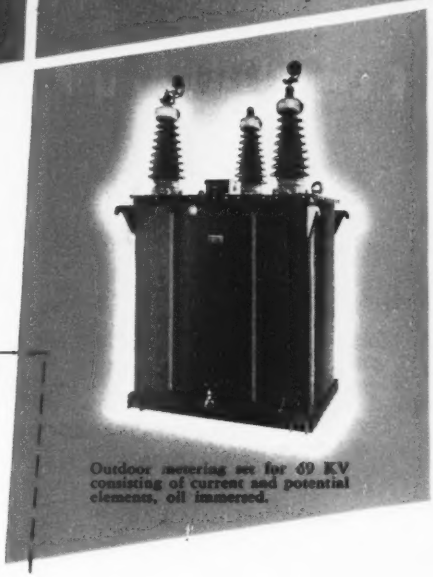




Type NA5 indoor current transformer. Primary current ratings of 200, 400 or 600 amperes. Capacity 25 volt amperes.



Indoor type unfused potential transformer 200 VA, 2400/120 volts, 60 KV FW impulse level.



Outdoor metering set for 69 KV consisting of current and potential elements, oil immersed.

When accuracy is a factor

In the field of measurement for precision metering, operation of indicating instruments, relays and control apparatus, there is no substitute for accuracy.

The Standard Transformer Company has designed and is manufacturing a complete line of accurate current and potential transformers for every application... current, potential and metering transformers for any voltage up to and including 72 KV, and at any specified frequency. All thermal and mechanical ratings in accordance with industry's requirements and standards for each specific use. All standards set by ASA and EEI-NEMA in respect to accuracy are met.

Many prominent manufacturers of switchgear and control apparatus are regular users of STANDARD current and potential transformers. Our production facilities are flexible and engineering skill versatile enough to produce quickly transformers of special design to meet your specifications. Call in your STANDARD representative for further information.

everything points to

WRITE FOR BULLETIN S-501-B

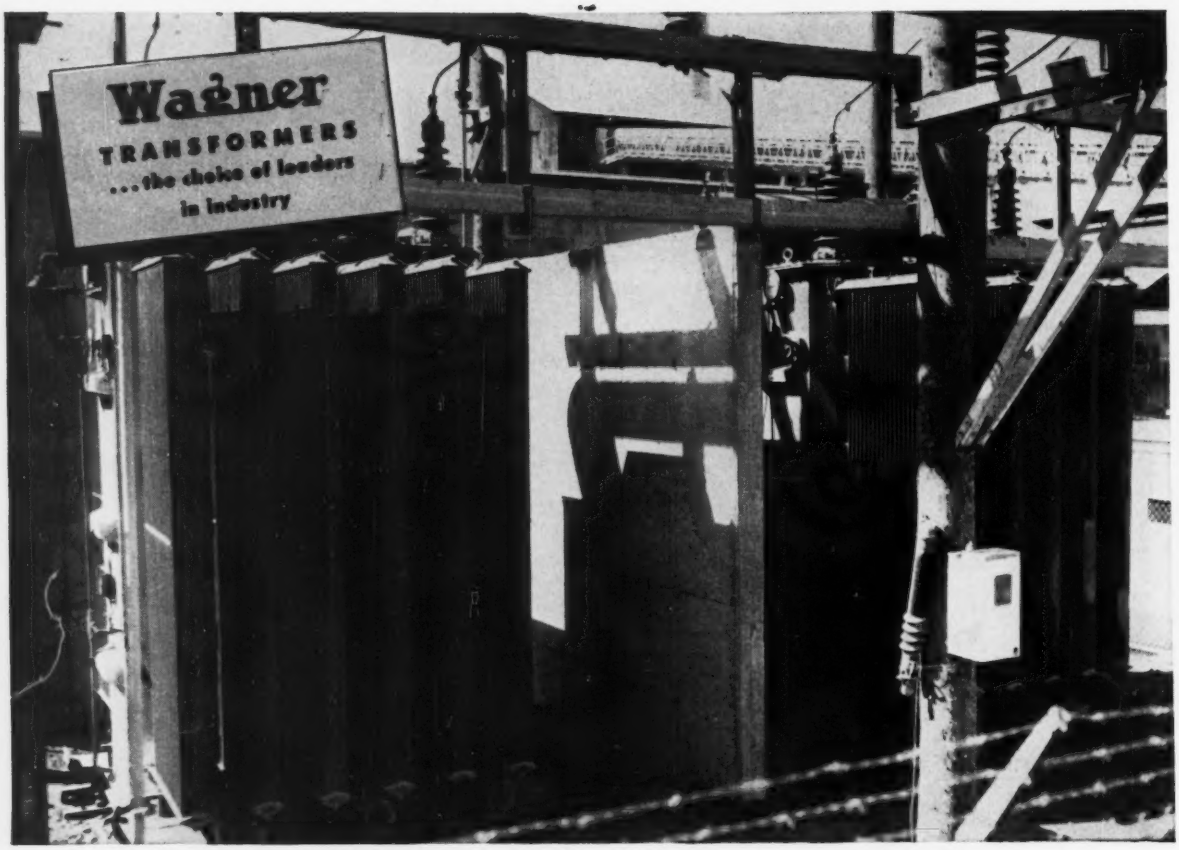
32 pages of detailed drawings, accuracy limits, ratio and phase angle curves for current, potential and metering transformers. Write for your copy today.

Standard

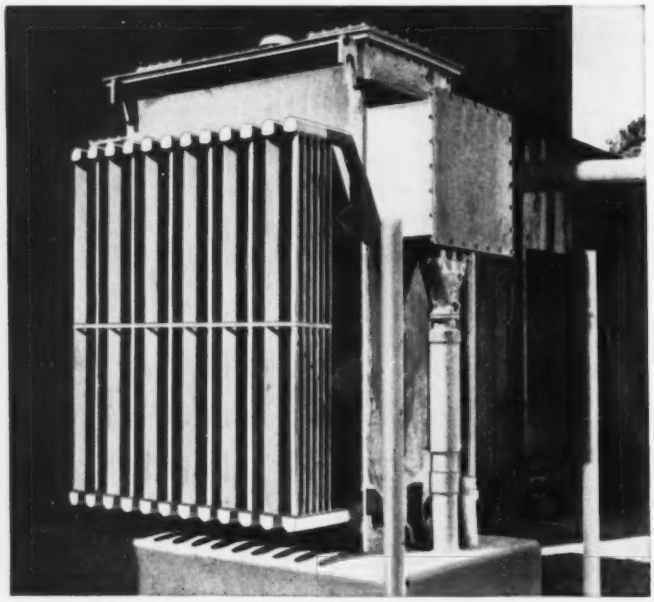
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES



DUPLICATE TRANSFORMERS and feeders allow either to carry load in emergencies. The three phase Wagner Power Transformers are each rated 6000 kva with provision for an increase in capacity to 8000 kva for future expansion.



ONE OF FIVE Wagner three phase, non-inflammable liquid filled unit substation transformers used in this installation. Each transformer is rated 750 kva, 2400 to 480 volts, 60 cycle; and each is located as close as possible to load center.

Wagner Power Transformers have been serving the power industry dependably for over sixty years. They are compact in design and are built with painstaking care to give them inherent strength and stability. They have sufficient capacity to not only carry their normal load, but to be able to handle loads—again and again—whenever emergencies arise.

Consult a Wagner engineer on your next transformer installation. Thirty-two branch offices, located in principal cities, are at your service. Bulletins TU-180 and TU-181 give information on the complete line of dependable Wagner Transformers.

Wagner Transformers selected for modernized distribution system in midwest cement plant

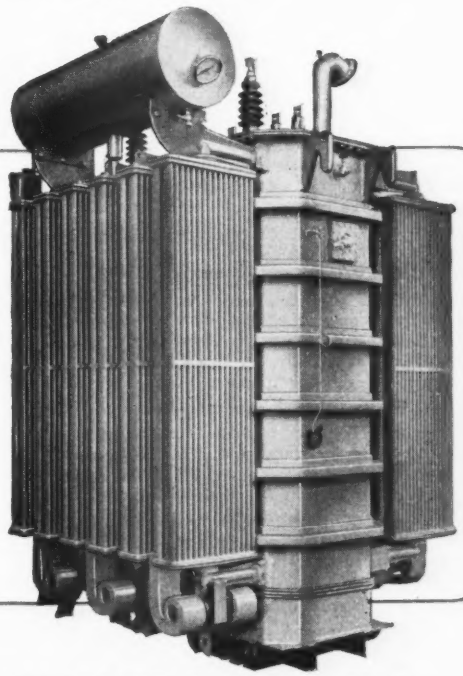
Cement making is a 24-hour, 7-day week business requiring some 80 separate operations, the use of much heavy processing machinery and equipment, and tremendous amounts of dependable power.

The modernized Prospect Hill plant of the Missouri Portland Cement Company provides a fine example of an up-to-date distribution system in an application where considerable amounts of power are utilized at primary voltages. 12,000 kva of transformer capacity was required for connected and demand loads, with provisions for a 33 percent increase in capacity for future expansion.

Two Wagner 3 phase power transformers, each rated 6000 kva, with an ultimate of 8000 kva to be obtained with the addition of cooling fans, were used to meet this requirement for the main substation.

In addition to the main substation, there are five 750 kva unit substations, each located as close as possible to the load centers of the particular areas they serve. These substations are powered by three phase Wagner unit substation transformers, each with identical specifications.

Wagner transformers were chosen for this installation, as they are for a great many industrial and power company installations, because of their ability to give continuous service over unusually long periods of time.



Wagner Power Transformers meet ASA C57 standards

Now, you can simplify your specifications and gain the advantages of improved design at reduced cost by ordering *standardized* Wagner Power Transformers. Wagner Transformers meet all ASA C57 standards for voltage ratings, taps, impedances and both standard and optional mechanical features. Get full information from your nearby Wagner engineer, or write us.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Avenue • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

T53-1

Line foreman has trouble, calls for materials fast.

"RCA 2-WAY RADIO cuts our outage time 90%"

says Mr. Milton Sturdivant, Superintendent of Construction and Maintenance, Brazos River Transmission Electric Co-operative, Texas

"WITH RADIO, our crew is on the job as fast as it formerly took us to reach a phone. *Radio is indispensable* . . . we just couldn't function without it."

RCA Radio covers big Texas utility

The Brazos River System stretches out over 100,000 square miles of Texas . . . includes steam plants, hydro plants, and 1000 miles of 69 KV lines. RCA 2-way radio operates from seven base stations in power plants, linemen's homes, and 28 mobile stations in cars, pick-ups, and trucks. Maintains instant voice contact between supervisors, foremen, load dispatchers, line crews, line patrolmen. Three years on the job, 2-way radio is giving the vital communications that keeps the system running smoothly.

Could your operation use radio?

Everywhere it's applied, *RCA 2-way radio works wonders.* Saves time, manpower, money. Ends aimless driving. Saves wear and tear. Speeds repairs in emergencies. Pays for itself many times over through better, more efficient operation.

Radio easy to install—operate—maintain

Mobile units are compact, rugged . . . can be installed in truck or car quickly and efficiently. Easily maintained, use standard tubes. Central transmitter serves any number of mobile units. Designed and backed by RCA . . . world leader in radio.

Get full story on RCA 2-way radio now. See how it can help out on your operation. Mail coupon . . . TODAY.

Near-by line truck is ordered to rush materials to trouble spot.

Meanwhile field superintendent also drives to trouble spot.

Dpt. 45MD, RCA Engineering Products Department, Camden, N. J.

Please send my FREE copy of illustrated booklet on how RCA 2-way radio can save time, manpower, and money for me.

Name_____

Title_____

Company_____

Address_____ City_____ State_____

RADIO CORPORATION of AMERICA

Industrial Briefs

(*Continued from page* 212)

smoking, packing precision instruments, etc. F. W. Conover, Power Eng., Cincinnati Gas & Electric Co.

In-plant feeding at Brubaker Mfg Co, Landisville, Pa., using electric coffee urn and 1.5-kw electric roaster (with broiler-grille) has created better employee relations and decreased labor turnover. 20 complete meals are served daily at noon-time. Also grille is used to cook hamburgers, hot dogs, etc., for 9:00 a.m. snack. Coffee urn supplies free coffee to employees anytime during day. D. C. Oberholzer, Industrial Rep., Pennsylvania Power & Light Co.

Hot press method of producing end blocking pieces for airplane landing mats at the Mackie Lovejoy Co, Chicago, Ill., has increased production 35 to 40% and reduced unit costs approximately 40% with a production rate of 45 units per minute. Rejects are negligible—less than 1%, due primarily to materials rather than method of operation. Electrically synchronized automatic operation controlling the complete conveyor system, synchronizing a pre-heat stage, an induction heated process and stamping operation has one-unit operation. A. C. Jorgensen, and W. J. Martinov, Commonwealth Edison Co, Chicago, Ill.

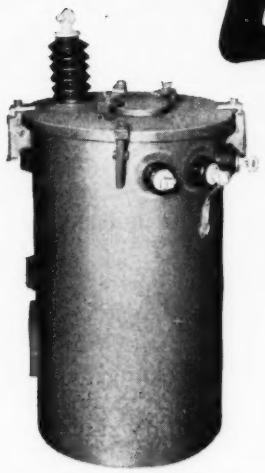
Bale handling with 1500-lb capacity electric fork truck at the Crystal Springs Bleachery, Inc, Chickamauga, Georgia, has released 5 men for more productive work. One truck with hydraulic clamp moves and stores 200,000 lb of cloth daily. Because the truck stocks bales three high, it has saved considerable floor space. Baker-Raulang Co.

SEND IN *YOUR* INDUSTRIAL BRIEF

You'll get more satisfaction from knowing your item helped someone else than from the $5 you will be paid for each item accepted. Give us the basic facts covering the application; the name and location of user; benefits, advantages, and load characteristics of the application. Mail to: Industrial Briefs Editor, Electrical World, 330 W. 42 St., New York 36.

"TRANSFORMERS?

...for Top Performance and Low Maintenance, give me Central!"



7 Reasons for Superiority of Central Transformers

1. *Skilled, Conscientious Workmanship*
2. *Tried-and-Proven Dependability*
3. *Trouble-Free Performance*
4. *Minimum Maintenance*
5. *Long Life*
6. *Reputation — Thousands in Use*
7. *Prompt, Efficient Service*

A TYPE FOR EVERY NEED:

Transformers in sizes from 3 KVA to 10,000 KVA, up to 115 KV primary class.

POLE TYPES: Manufactured in sizes from 3 through 100 KVA, 15 KV primary class, for direct pole mounting, or for use with crossarm hangers . . . Illustrated above is 15 KVA one-bushing type; below is 50 KVA two cover bushings.

Central CTC

TRANSFORMER CORP.

FORMERLY LARKIN LECTRO PRODUCTS CORPORATION

PINE BLUFF, ARKANSAS

SALES OFFICES IN PRINCIPAL CITIES

80 years ~~old~~ young

Age in itself means very little. But age accompanied by historic achievements and age that is continuing to produce the finest products of their type is something of which we are proud.

1873

Founded in 1873, The R. Thomas and Sons Company very early became closely allied to the electrical industry.

1885

In 1885, the first "Thomas Quality" insulator was produced, the first shipment going to the U.S. Electric Lighting Co., Chicago.

1893

In 1893, all of the porcelains used in the lighting arrangement for the World's Fair at Chicago, installed by Westinghouse, were Thomas.

1896

In 1896, Thomas perfected the first multi-part, high-voltage, pin-type insulator. It was known as the "Boch" Glaze-Filled Insulator, later to be patented under No. 600,475. It represented the initial step toward making possible the transmission of electrical energy at higher voltages.

1907

In 1907, Thomas designed and made the first cap-and-pin suspension insulator. Units installed that year are still giving trouble-proof service after 46 years of continuous operation.

1917

In 1917, we introduced the Thomas link-type Hewlett suspension insulators. Insulator failure being virtually unknown with this design, it is easy to understand why hundreds of thousands are still giving satisfactory service today.

1938

In 1938, Thomas engineers pioneered and were first to develop the under-glaze metallic oxide coating that guarantees the "noise-free" operation of the patented Thomas "Q-T" Insulators. (Patent No. 2154387)

These are among the many Thomas "Firsts" and contributions which have helped the Electrical Industry reach its present position.

TODAY, in our 80th year, we are ready with improved facilities and increased capacity to meet the most exacting needs of the Industry. After all is said, it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Why gamble?

The R. Thomas and Sons Co.

1873 THOMAS INSULATORS our 80th year RELIABILITY 1953

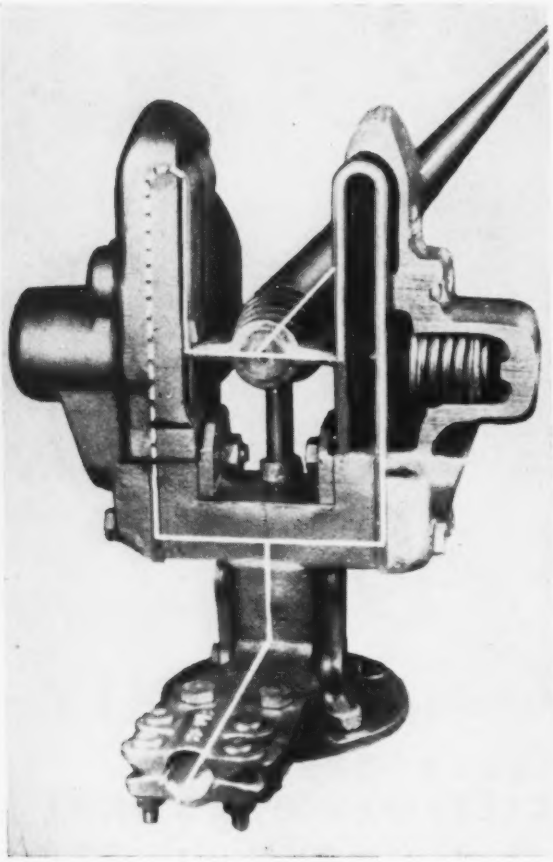
LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Ken H. Best, *Seattle* • R. E. Cunningham & Son, *Los Angeles* • W. H. Eddy Electric Products, Inc., *Phoenix* • Engineer Sales Corp., *St. Petersburg* • Hamilton Associates, *Denver* Geo. E. Honn Co., *San Francisco* • Hugo Sales Co., *Minneapolis* • W. A. Leiser & Co., *Philadelphia* • John G. Pettijohn Co., *Knoxville* H. E. Ransford Co., *Pittsburgh* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan Co., *Boston* • Tafel Electric & Supply Co., *Louisville* Walter E. Thompson Co., *Birmingham* • Triangle Electric Supply Co., *El Paso* • United Electric Supply Co., *Salt Lake City* • Williamson Sales Co., *Shreveport, Amarillo, Corpus Christi, Dallas, Houston, New Orleans, Pine Bluff* • *Representatives in other principal cities*

1953
Thomas QUALITY
INSULATORS AND
ACCESSORY HARDWARE

Magnetic Fields Around Conductors Aid Contact Pressure

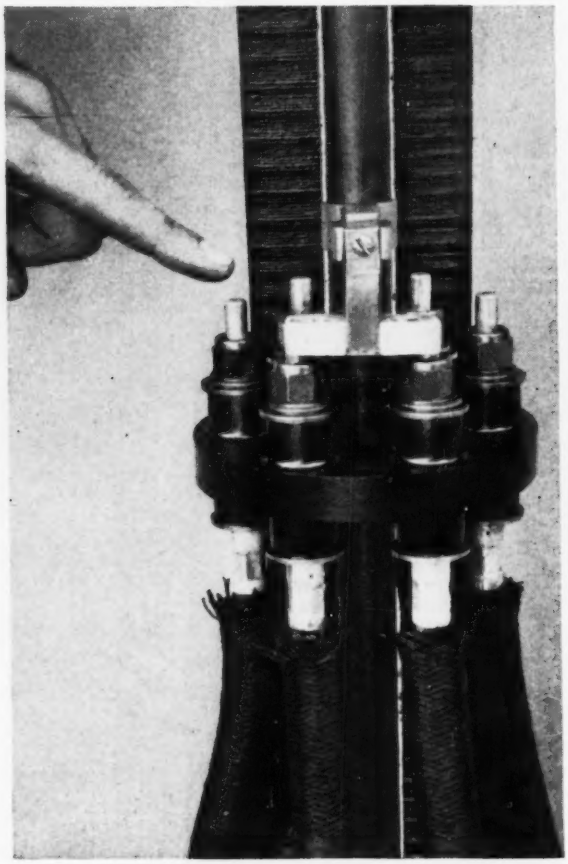


Air Break Switch

Called "Amplitact," has greater current carrying capabilities because it utilizes the magnetic fields surroundings conducting members to effect higher contact pressure. It works on the electromagnetic principle that causes two parallel conductors with current flowing in the same direction to attract, and with current flowing in opposite directions to repel each other.

At the contact surface, currents and flux are 90 deg out of phase, tending to hold the revolving blade in the closed position. Parallel current paths in the resilient U-shaped contacts are unidirectional relative to identical portions of both contacts. Therefore, the inner segments of the inverted U contacts are attracted together. Current in the two halves of a U contact is flowing in opposite directions so that these sections tend to repel each other.

Southern States Equipment Co, Hampton, Ga.



No-Load Tap-Changer

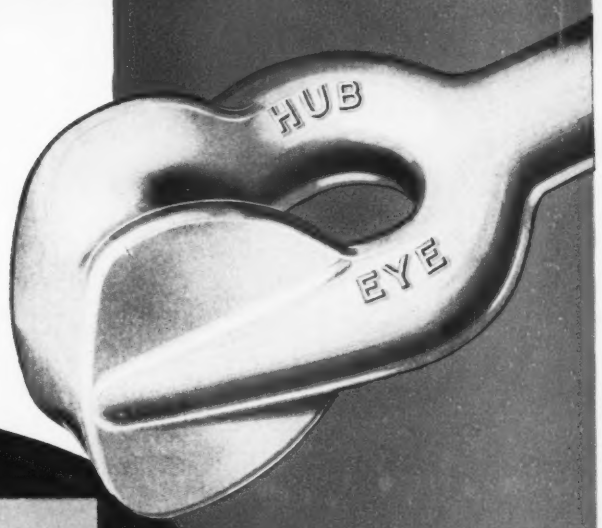
Type WSB, has ¼ in., blunt nose stationary contacts. Moving contacts consist of two short metal bars supported from tap-changer mechanism, shaped to fit snugly around the pins.

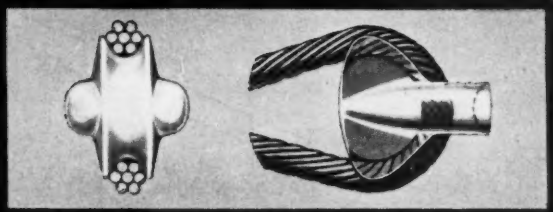
Spring force to hold bars against pins is minimized because magnetic field around bars pulls them together. Switch operations therefore require little physical effort as the spring pressure is minimized. The switch is said to have passed 80,000 amps through the contacts without blowing bars apart or burning contacts. Models rated at 100 and 200 amp are in production.

Shielded shafts have been reduced in length 50% through the use of insulating paper wrapped around the metal rings, which reduces the clearances required to withstand the high 60-cps and surge voltages.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

"For the Best GUYS in the World"

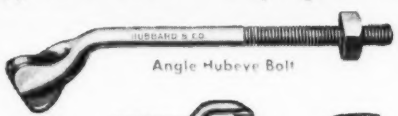




End view showing sidewall support of strand by Hubeye.

Side view showing lay of strand in Hubeye. Fully rounded bearing area is provided.

Typical Hubbard Guying Items



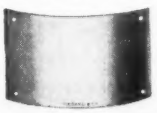
Angle Hubeye Bolt

Three-Hubeye Anchor Rod

ServiSleev

Strain Plate No. 7577

Storm Guy Hook No. 6001



Strain Plate No. 7575

Storm Guy Hook No. 7585

From arm to anchor, Hubbard has a complete line of guying accessories that are "good for the life of the pole." There's a variety of anchors to meet every soil condition, to carry any load . . . guy protectors that are designed for maximum strength and visibility . . . Servi-Sleevs for the best looking serve in five seconds flat . . . Hubeye anchor rods and bolts with strand protection . . . clamps that grip the strand and won't let go . . . strain plates . . . storm guy hooks . . . hundreds of items that make it easier for the lineman to service the "best guys in the world."

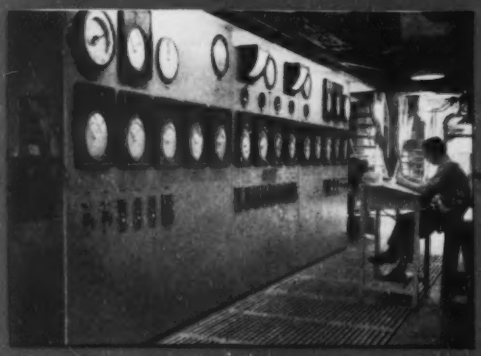
HUBBARD AND COMPANY

ESTABLISHED 1843

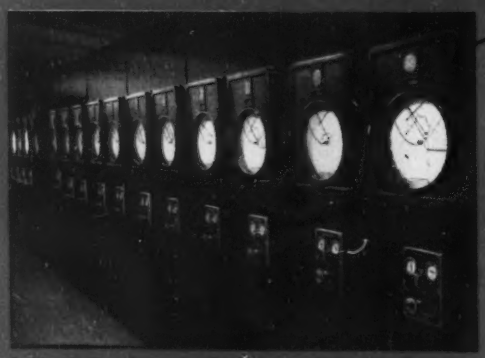
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

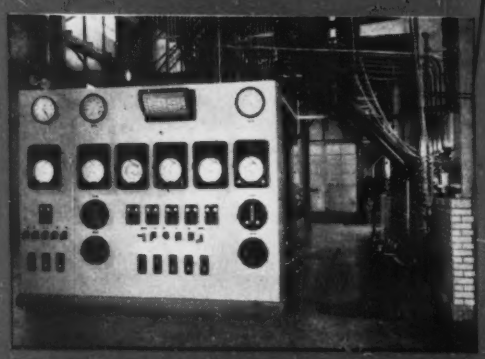
Bailey Boiler Control — Gas or Oil Firing — Pacific Gas & Electric Co., Avon Station.



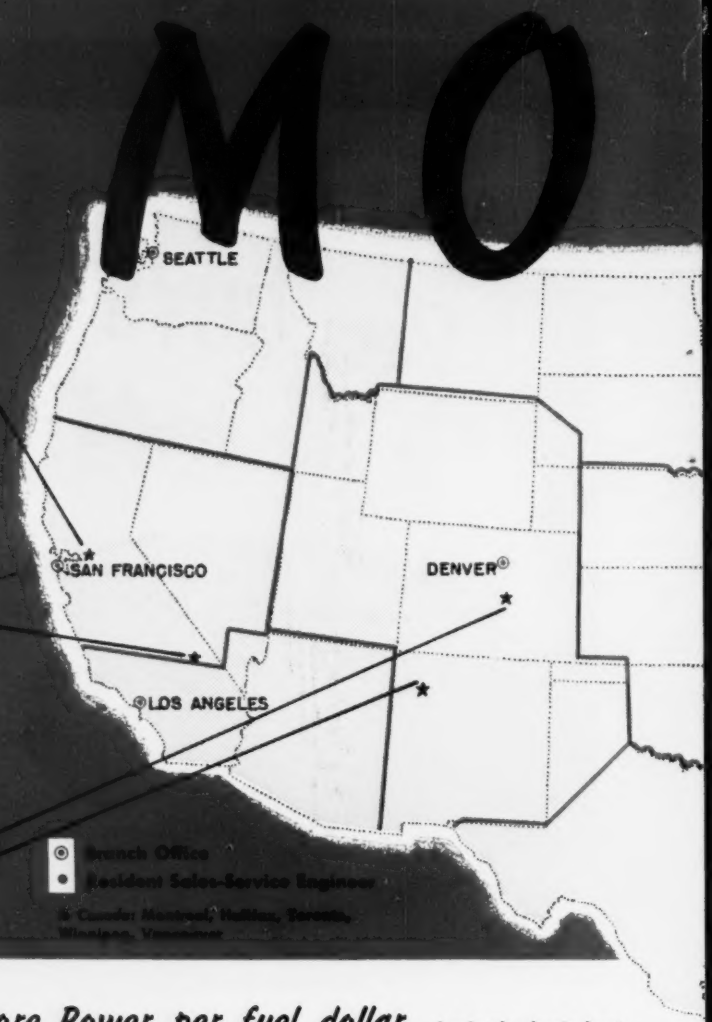
Bailey Boiler Control — Oil Firing — American Potash and Chemical Corp., Trona, Calif.



Bailey Boiler Control—Gas Firing—Colorado Fuel and Iron Corp., Pueblo, Colo.



Bailey Boiler Control — Gas Firing — Public Service Co. of New Mexico, Albuquerque, N. M.



More Power per fuel dollar—that's the basic business of Bailey Meter Company. Our products and services are designed to deliver increased power plant efficiency for you, whether your plant is large or small. We have had a wealth of experience on every size and type of steam generating equipment.

Here are some of the reasons why we believe we have more to offer you in this field than any other single manufacturer:

More Complete Range of Equipment

Our fully co-ordinated line of Meters and Controls is offered for a wide variety of services and in a complete range of types. This means you need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment merely because he is unable to offer the exact one best suited to your needs. It means, too, that you need never fear a buck-passing division of responsibility for the efficient operation of your complete boiler control system.

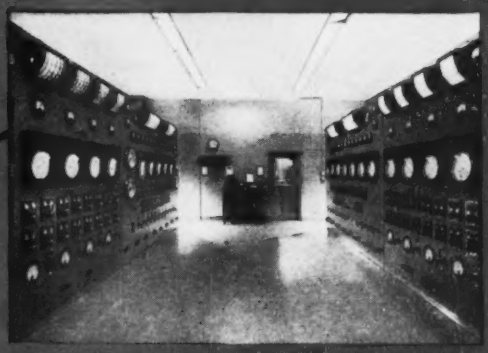
More Experienced Engineering Service

When you discuss your power plant problems with a Bailey Sales-Service

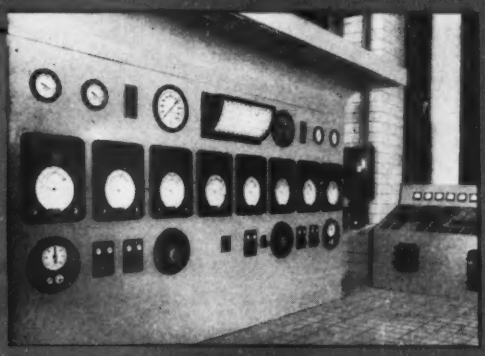
Giving More Power to You...

CONTROLS for—Combustion • Feed Water • Temperature • Pressure • Liquid Level • Feed Pumps

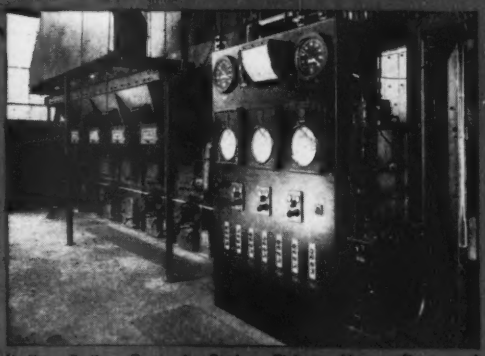
RE!



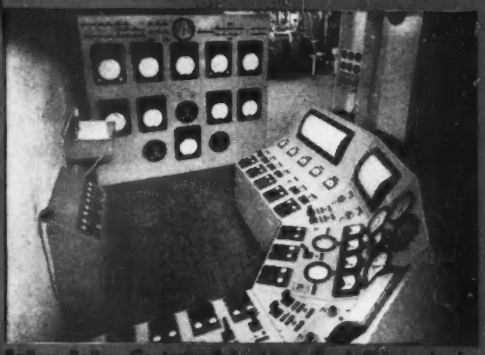
Bailey Boiler Control—Pulverized Coal Firing—Buffalo Niagara Electric Corp., Huntley Station No. 2.



Bailey Boiler Control—Pulverized Coal Firing—Rockland Light and Power Co., Tomkins Cove, N. Y.



Bailey Boiler Control—Stoker Firing—Hanes Dye and Finishing Co., Winston-Salem, N. C.



Bailey Boiler Control—Pulverized Coal Firing—Louisville Gas and Electric Co., Paddy's Run Station.

Engineer, you get advice from an organization with a background of more knowledge and experience in steam plant operation than any other manufacturer of instruments and controls can offer you. Our field representatives are graduate engineers with specialized training in combustion, flow measurement and automatic control. Each has completed an intensive course in theory and practice at our plant before being given a field sales-service assignment.

More Direct Sales-Service Offices

Bailey Meter Company's sales-service engineers are located in more industrial centers than those of any other manufacturer of boiler control systems. Truly, prompt and capable service—and with a minimum of travel time and expense—is as near as your telephone. In emergencies a trained Bailey Engineer is available in a matter of minutes or a few hours at the most.

Giving More Power to You

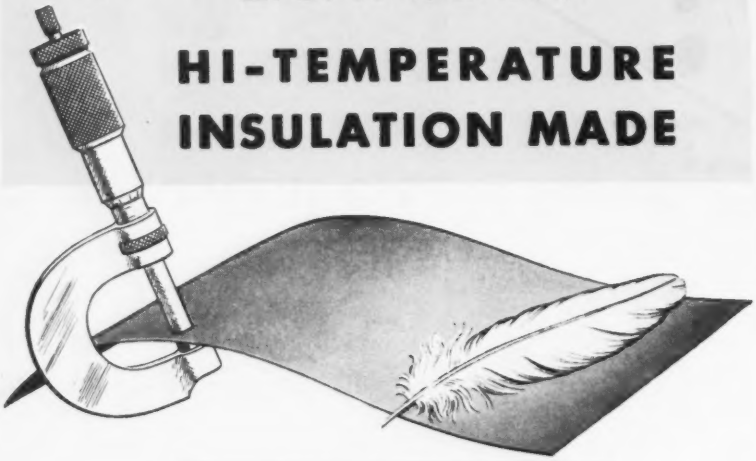
Better power plant operation calls for more power per fuel dollar, less outage, and safer working conditions. We help you to get all of these. Write for Bulletin 18 describing Bailey Meters and Control Systems.

Bailey Meter Company

1060 Ivanhoe Road, Cleveland 10, Ohio • Bailey Meter Company Limited, Montreal, Canada

The THINNEST LIGHTWEIGHT

HI-TEMPERATURE INSULATION MADE



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SIL-THIN-GLAS .002 and .003

and

SIL-THIN-BESTOS .003 to. 0035

offer design economies at higher temperatures

Electro Extra Thin Hi-Temperature Insulation possesses exceptional dielectric and tensile strength. Its thinness, flexibility and lightweight permits compact construction . . . size and weight reduction of electronic and electrical equipment.

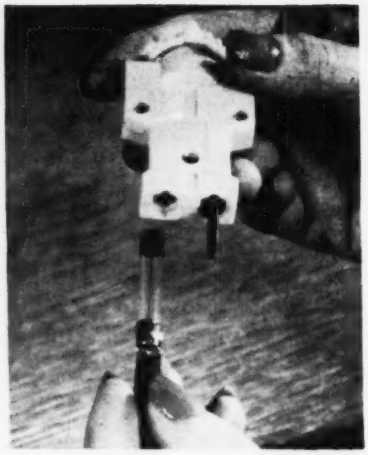
These Electro products meet all Class "H" requirements and are available in rolls, sheet or tape form.

For complete data or samples of these and other ELECTRO products contact Dept. E1

ELECTRO-TECHNICAL PRODUCTS

DIVISION OF SUN CHEMICAL CORPORATION

113 East Centre Street, Nutley 10, N. J.



Fused Plug

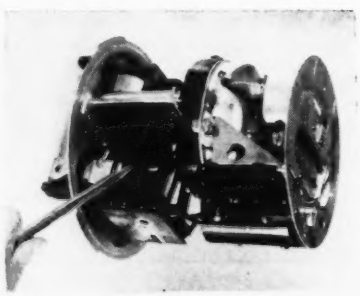
Reduces the possibility of the main fuse blowing because of a shorted appliance. A 250-v glass cartridge fuse is attached to each prong and is removed by pressing the prong into plug and twisting. Wires are connected by inserting the insulated wires into the plug and turning a locking spring. Connection claimed to need no wire stripping or soldering; no tools are used.

Noma Electric Corp, New York 11, N. Y.

Angle Locknut Pliers

Tightens locknuts in outlet boxes, removes burrs from steel tube or conduit, and cuts and skins rubber covered wire. Pliers feature a roller jaw that rotates freely inside the standard outlet box locknut. Other jaw catches and turns the lug of the locknut. The latter jaw has a cutting edge.

Utica Drop Forge & Tool Corp, Utica, N. Y.



Thermal Demand Meter

With 200-amp ratings in both single-phase and polyphase varieties have been developed. Meter has basic fea-

(*Continued on page* 228)

Rely on Quality

INDUSTRIAL

PYLE-NATIONAL LIGHTING FIXTURES

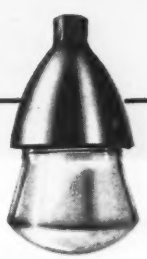
for longer service life, added Safety and Efficiency

EXPLOSION-PROOF

Pyle-National LE Series (Class 1, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.

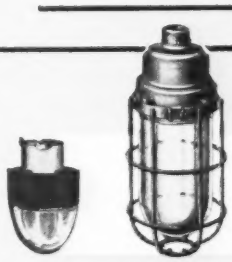


DUST-TIGHT

Pyle-National DE Series (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

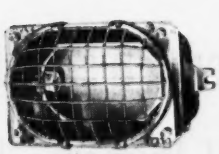


VAPOR-TIGHT

Pyle-National BO Series and Signal or Pilot Lights

For use in any outdoor or indoor location subjected to heavy concentration of non-flammable vapors, gases, dusts, or moisture.

Heavy-duty construction with efficient sealing features insures exceptionally long-life service. Full line for 10 to 200 watt lamps.

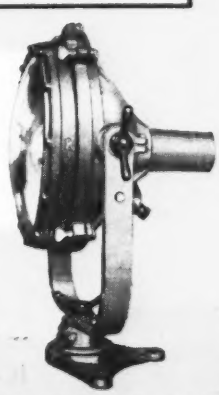


VAPOR-TIGHT PIT FLOODLIGHT

Especially designed for recessed or surface mounting in walls or ceilings of pits, subways, or other locations where heavy moisture prevails. Reflector can be pivoted to adjust the angle of beam. Front glass is heat and impact resisting. Water drainage slots on cover.

WEATHER-PROOF ENCLOSED FLOODLIGHTS

Sealed against moisture and dirt. Constructed throughout of cast aluminum and other corrosion-proof materials. Floodlights retain their original high efficiency output throughout an exceptionally long-service life with negligible maintenance and replacement expense.



SINCE 1897

THE PYLE-NATIONAL COMPANY

1835 N. KOSTNER AVENUE • CHICAGO 51, ILLINOIS

District Office and Representatives in Principal Cities of the United States. Export Department: International Railways Supply Co., 30 Church St., New York. Canadian Agent: The Holden Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver.

CONDUIT FITTINGS • PLUGS AND RECEPTACLES • TURBO-GENERATORS • GYRALITES • MULTI-VENT AIR DISTRIBUTION

significant statistics of

Number of Units Ordered_ _

Number of Units in Service_ _

Total Capacity—KW_ _

Capacity in Service—KW_ _

Capacity—Controlled Circulation Boilers—KW_ _

Capacity fired by Tilting Tangential Burners—KW_ _

COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

C-E Reheat Boilers

for period 1947 through 1952

	123
	29
	13,990,000
	2,410,000
	4,640,000
	13,050,000

B-641

— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.

GET GROUND LEVEL EFFICIENCY

40* feet High with the Industrial Monkey

...the foot-controlled telescoping boom that takes the man straight to the job with BOTH HANDS FREE FOR WORK

Enable your men to work at ground level efficiency when the job is forty feet high! They'll get *more* work done, safer, faster and at *less* cost with an Industrial Monkey. You'll save man-hours, time and operating costs on *all* high work jobs. The Industrial Monkey pays for itself in savings alone in a surprisingly short time!

The Monkey — a hydraulically-operated telescoping boom with an insulated (24,000 volts) self-leveling cage — has been *job-tested* and *experience-proved* to become standard equipment with many utility companies.

The Monkey operates from horizontal to vertical with a 270° arc and is foot controlled with dual controls in the truck cab. *The operator has both hands free for work!* Cut the high cost of high work with Industrial Monkeys!

***40 feet, ground-to-floor of platform**
PLUS
the man's height
PLUS
his reach

Call, write or wire* TODAY *for complete details.

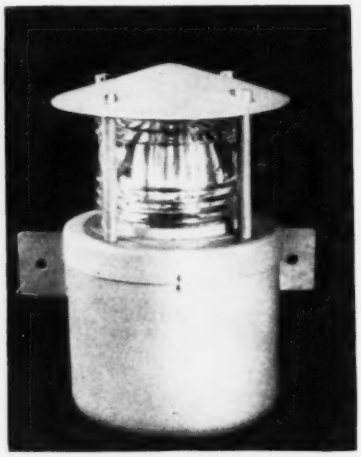
THE DONWILL COMPANY
835 S. E. MAIN STREET, PORTLAND 14, OREGON
MOBILIFT CORPORATION • 2317 W. 18th, CHICAGO
790 PATTERSON AVE., E. RUTHERFORD, N. J. • 2724 TAYLOR ST., DALLAS
1113 SPRING ST. N. W., ATLANTA • 2730 SAN PABLO AVE., BERKELEY

New Equipment

(*Continued from page* 224)

tures of 100-amp size, increased insulation for greater surge strength, and a current transformer to supply both electromagnet and thermal element. Claimed to be more easily repaired and cleaned.

Westinghouse Electric Corp, Pittsburgh 30, Pa.

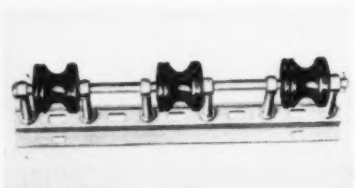


Photoelectric Control

Provides complete automatic regulation of artificial lighting where exact controls are required, A time delay circuit is included to preclude lightning flashes, passing automobile headlights and flashing signs. Delay period is 18 sec and independent of sensitivity control settings. Claimed to operate under all conditions of temperature and humidity normally encountered.

The load relay is positive and chatter-free in operation. Available in 500-w and 3-kw lamp load ratings. It is designed to operate on 105 to 125-v from a 50 to 60-cps supply.

Solartron Corp, New York 21, N. Y.



Secondary Racks

For light, medium and heavy duty, which conform to EEI Specification TD-7. Medium and heavy duty racks

(*Continued on page* 232)

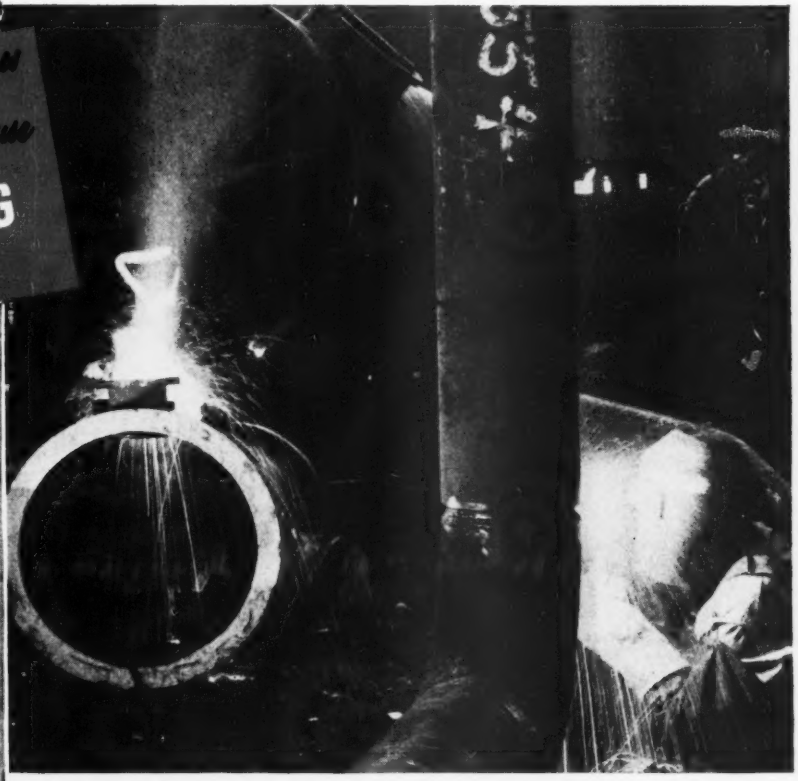
To master high temperatures and pressure these leading companies use

M. W. KELLOGG

power piping!

American Gas & Electric Service Corp.
Boston Edison Co.
Central Hudson Gas & Electric Co.
Chaudronneries A. F. Smulders (Belgium)
Compania Argentina De Electricidad (Argentina)
Compania De Fuerza Del Suroeste De Mexico S.A. (Mexico)
Consolidated Edison Co. of N. Y.
Detroit Edison Co.
Dow Chemical Co.
Elektricitetsselskabet Isefjordvaerket (Denmark)
Ford Motor Co. of Canada Ltd. (Canada)
General Electric Co.
Hartford Electric Light Co.
Houilleres Du Bassin De Lorraine (France)
Houilleres Du Bassin Du Nord Et Du Pas-De-Calais (France)
Hydro-Electric Power Commission of Ontario (Canada)
Indiana & Michigan Electric Co.
Interbrabant (Belgium)
Long Island Lighting Co.
Metropolitan Edison Co.
Mexican Light & Power Co. (Mexico)
Monongahela Power Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Palestine Electric Corp., Ltd. (Israel)
Philadelphia Electric Co.
Public Service Co. of Northern Illinois
Public Service Electric & Gas Co. of N. J.
Societe Anonyme John Cockerill (Belgium)
Societa Edison (Italy)
Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)
Societa Meridionale Di Elettricita (Italy)
Sociedad De Electricidad De Rosario (Argentina)
Union D'Electricite (France)
United Illuminating Co.
Westinghouse Electric Corp.
West Penn Power Co.
Wisconsin Public Service Corp.

KELLOGG



This kind of welding stands up under 1100F and 2350 PSIG... *because*

When these welders in Kellogg's Jersey City fabricating shops strike their arcs in welding high-temperature, high-pressure power piping for a modern steam-powered central utility station, their expertness is backed by much more than personal know-how.

The beads they lay can be counted on to stand up because of the outstanding amount of welding technology acquired by Kellogg during the three decades it has been servicing this vital industry. From carbon steel, through low alloy steel, to stainless steels for handling temperatures now exceeding 1100F and pressures of 2350 psig, Kellogg has fabricated literally miles of this critical equipment. These welders can call on the knowledge gained in more than 160,000 man-hours spent just in welding alloy piping alone.

They have behind them one of the most complete metallurgical laboratories in the country . . . a special welding-technique development section . . . experience gathered in collaborative research with the leading turbine, boiler and steel manufacturers of the country . . . the most up-to-date non-destructive testing equipment available.

It is because of such men and their firm technological backing, that Kellogg is specified again and again by important power companies for critical power piping jobs all over the world.

OTHER FABRICATED PRODUCTS including:
Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . Heat Exchangers . . . Process Piping . . . Bends and Headers . . . Giant One-Piece Bends . . . Forged and Welded Fittings . . . Radial Brick Chimneys

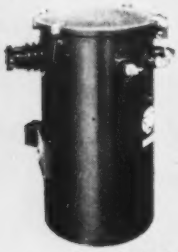
for 51 years an integral part of industrial progress!

The M. W. Kellogg Company (A Subsidiary of Pullman Incorporated)
Offices in New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.

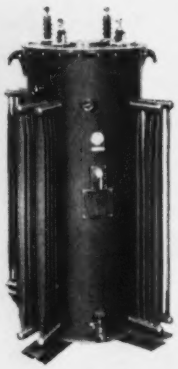
POLE STAR DISTRIBUTION TRANSFORMERS

Pole Star Distribution Transformers — 3 Kva through 500 Kva, 2400 through 67,000 volts

Protected Pole Star (CSP® Transformers) 3 Kva through 100 Kva 2400 through 14,400 volts



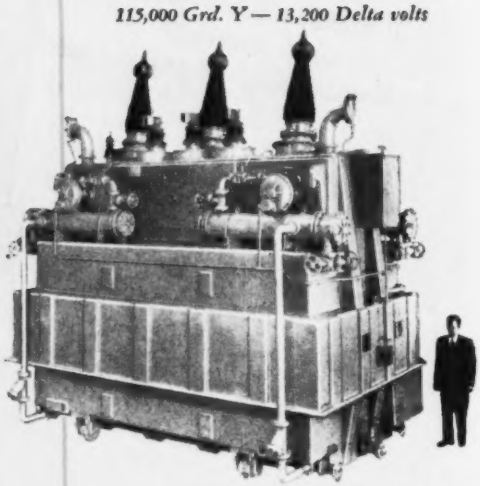
5 Kva Pole Star 2400/4160Y — 120/240 volts



500 Kva Pole Star 13,200 — 2400/4160Y volts

105,000 Kva, Three-phase

115,000 Grd. Y — 13,200 Delta volts

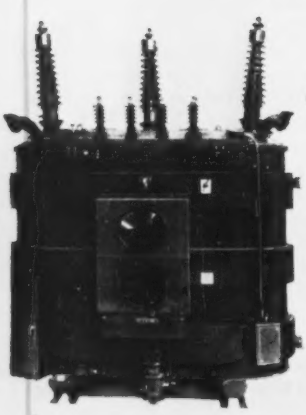


CONTOUR DESIGN

TRANSFORMERS...

PENNSYLVANIA TRANSFORMER COMPANY'S ONLY PRODUCT

CORE FORM POWER TRANSFORMERS



138,000 Volts

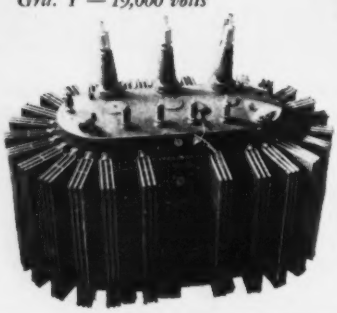
37,500 Kva, Three-phase 132,000 Grd. Y — 24,000Y/13,860 — 6900 Delta volts

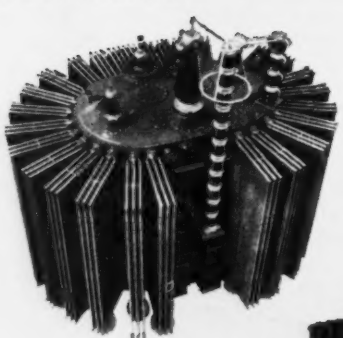
132,000 Volts

20,000 Kva, Three-phase, 132,000 Delta — 26,400Y/15,240 volts

161,000 Volts

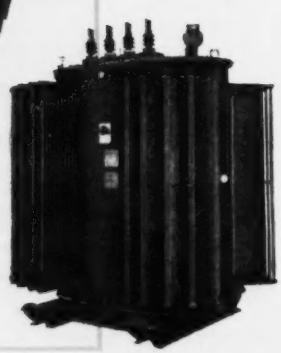
56,000/70,000 Kva. Single-phase. 93,000/161,000 Grd. Y — 19,000 volts

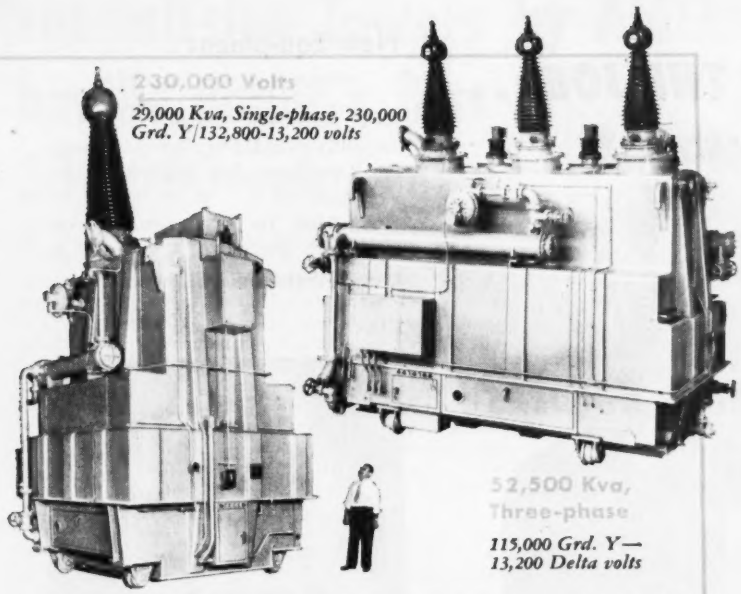




STANDARD PARTS POWER TRANSFORMERS

Three-phase: Up to 10,000 Kva, 34 Kv
Single-phase: Up to 5,000 Kva, 34 Kv





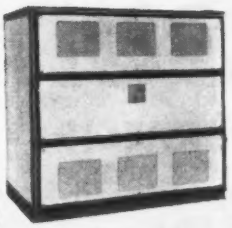
230,000 Volts

29,000 Kva, Single-phase, 230,000 Grd. Y/132,800-13,200 volts

52,500 Kva, Three-phase

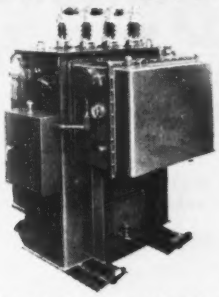
115,000 Grd. Y— 13,200 Delta volts

SHELL FORM POWER TRANSFORMERS



DRY TYPE

Sealed, Ventilated and Forced-Air-Cooled



STEP VOLTAGE REGULATORS

Up to 750 Kva for plus or minus 10% regulation in 32 steps

DISTRIBUTION TRANSFORMERS

3 Kva through 500 Kva
Up to 67,000 volts

POWER TRANSFORMERS

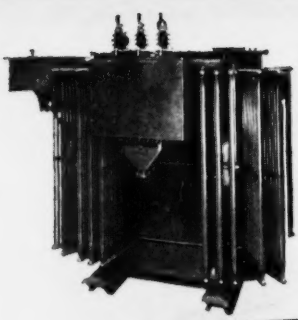
750 Kva to 250,000 Kva
Up to 330,000 volts

For 24 years, we have concentrated on designing and manufacturing one product — transformers. Each year we do more business than the previous year, and each year we keep bettering our product. We count among our customers the finest Utilities and Industrials in the country. We believe that if you are interested in transformers, you'll want to investigate Pennsylvania. We invite you to contact us.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division

CANONSBURG, PA. *Greater Pittsburgh District*

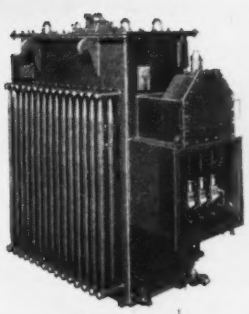


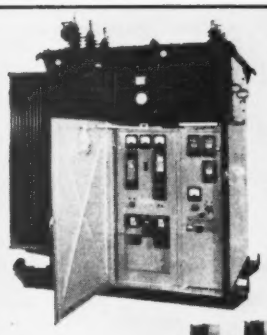
ASKAREL

Non-inflammable, liquid-filled Distribution and Power Sizes

NETWORK

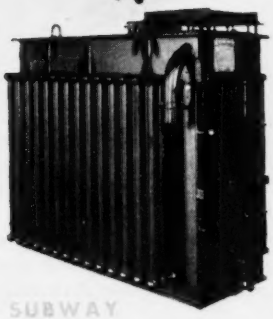
300 through 1,000 Kva. 2400 through 34,400 volts





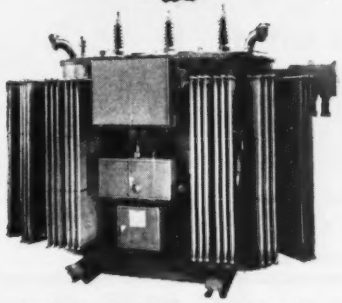
UNIT SUBSTATION

Single-Circuit and Duplex Unit Substations



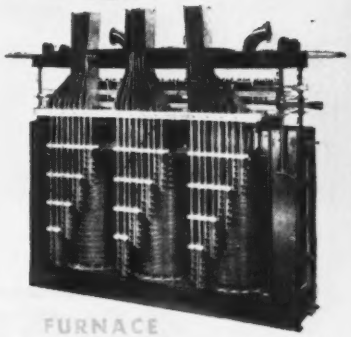
SUBWAY

Submersible Type, Single and Three-phase



LOAD RATIO CONTROL

For changing transformer taps under load in sizes up to 50,000 Kva



FURNACE

For operating Electric Arc Furnaces of any tonnage

BE SURE OF THE JOB...

SPECIFY and INSTALL

Blackhawk Industries

No. 3626 WIRE HOLDERS

Top quality porcelain with smooth round edges to protect wire insulation

1" diameter hole in porcelain

Porcelain has compression strain only

Heavy steel base and supporting strap

2⅞" diameter base

No. 22 square shoulder screw cannot slip or turn

All metal parts hot dip galvanized

Ideal for aluminum service drop cable installations

REA Approved

Meets Military Specifications (MIL-I-787A, 15 April 1952 superseding JAN-H-787 and amendments)

WHEN YOU BUY ASK FOR B-I

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BLACKHAWK INDUSTRIES
Dubuque, Iowa

Blackhawk Industries

Entrance Cable Fittings . Staples . Yard Lights Sill Plates . Locknuts and Bushings . Wire Holders Fluorescent Brackets . Cable and Conduit Straps Connectors . Box Supports . Conduit Entrance Caps . Grounding Assemblies.

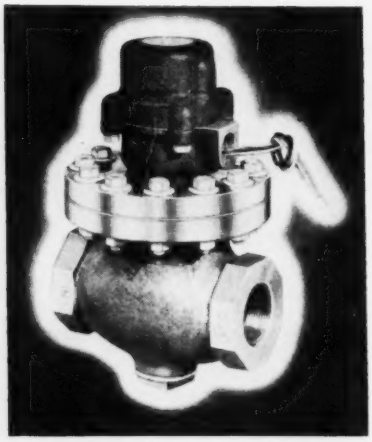
New Equipment

(*Continued from page* 228)

have forged-leg design; edges are smoothly rounded to eliminate damaging rope lines; they are hot-dip galvanized.

Available for two, three or four wires with spacings of 4, 8, or 12 in.

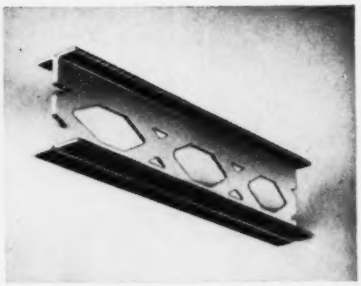
Line Material Co, Milwaukee, Wis.



Solenoid Valve

Available for high pressure applications, are made in sizes from ½ in. to 1½ in. For pressures up to 3,000 psi. Designed with three moving parts and external linkage, they are applicable where media is not harmful to bronze or stainless steel. Solenoid housings are offered as dust-tight, water-tight or explosion-proof.

Atkomatic Valve Co, Indianapolis 25, Ind.



Structural Members

Called "Lightsteel," include studs, joists and accessories for erection of steel building frameworks. They are fabricated from strip steel by cold rolling. Because of open web design, the sections are lighter than conven-

Transmission Towers by AMERICAN BRIDGE handle nation's first 330,000-volt line

● The first leg of the American Gas and Electric Service Corporation's projected high voltage transmission network has been completed with the construction of a 63-mi. 330,000-volt, double circuit link running from Appalachian Electric Power Company's Kanawha River, W. Va., station to its Philip Sporn plant.

The towers for this record-setting line were designed and fabricated by American Bridge as the result of valuable data gathered from the A. G. & E. sponsored 500,000-volt test line at Ohio Power Company's Tidd plant, Brilliant, Ohio, in cooperation with other manufacturers of high voltage transmission line equipment.

These towers are approximately 150 feet tall and carry 6 conductors of 1,275,000 C.M., A.C.S.R. expanded cable (1.6"OD). The towers are designed for straight-line spans of 1700 ft.

The technical knowledge and field experience American Bridge has acquired in this and hundreds of other transmission line installations may be just the answer to your tower problems. Our engineers welcome an opportunity to figure with you without obligation. Just write to the nearest office listed below.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON
CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • DULUTH • ELMIRA
GARY • MEMPHIS • MINNEAPOLIS • NEW YORK • PHILADELPHIA • PITTSBURGH
PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

DESIGN REDUCES FOUNDATION INSTALLATION COSTS. Important savings in time, labor, and materials were made possible through use of steel grillage earth anchors and variable leg extensions as shown above. Many other simplified installation and frill-free construction features are obtained through American Bridge designs.

USS TRADE MARK

AMERICAN BRIDGE

UNITED STATES STEEL

for positive control of street lighting

The FISHER-PIERCE Series 63300B PHOTOELECTRIC CONTROL

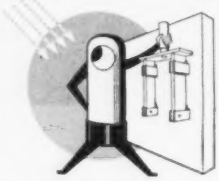
PHOTOELECTRIC CONTROL means the added *safety* of street lighting *when it is needed* — regardless of time of day, season, climate or weather conditions. Control is fully automatic. Even after temporary line power failures the control operates correctly with no need for manual resetting.

FISHER-PIERCE Photoelectric Controls for street lighting have proven themselves in over 35,000 installations made by more than 700 electric utilities.

The electronic circuit of the Series 63300B control provides dependability made possible by over seven years of practical experience. Amplifier tubes consistently have a life of more than 20,000 hours. Other components have much longer life. Units are rated 2500 V.rms hipot to give maximum resistance to the effects of lightning transients. The built-in contactor is conservatively rated to handle a 3000 watt lighting load. The unit has Standard meter socket plug-in construction with cross-arm mounting bracket which gives great installation flexibility.

The control itself gives *truly* economical (*low* purchase cost, *low* installation cost and *low* maintenance cost) and effective service backed by an extensive engineering service organization field experienced in street light control application.

Write for Bulletin 63300B.



The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

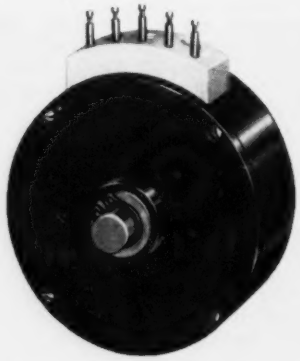
EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.

tional types, making them easier to handle. Claims say, there is no sacrifice of strength and a 3¼-in. stud is lower in cost than a 2 x 4, in some areas.

Sections are available in 3¼, 3⅝, 4, 6 and 8-in. depth, and in lengths up to 28 ft.

Penn Metal Co, Inc, New York 17, N. Y.



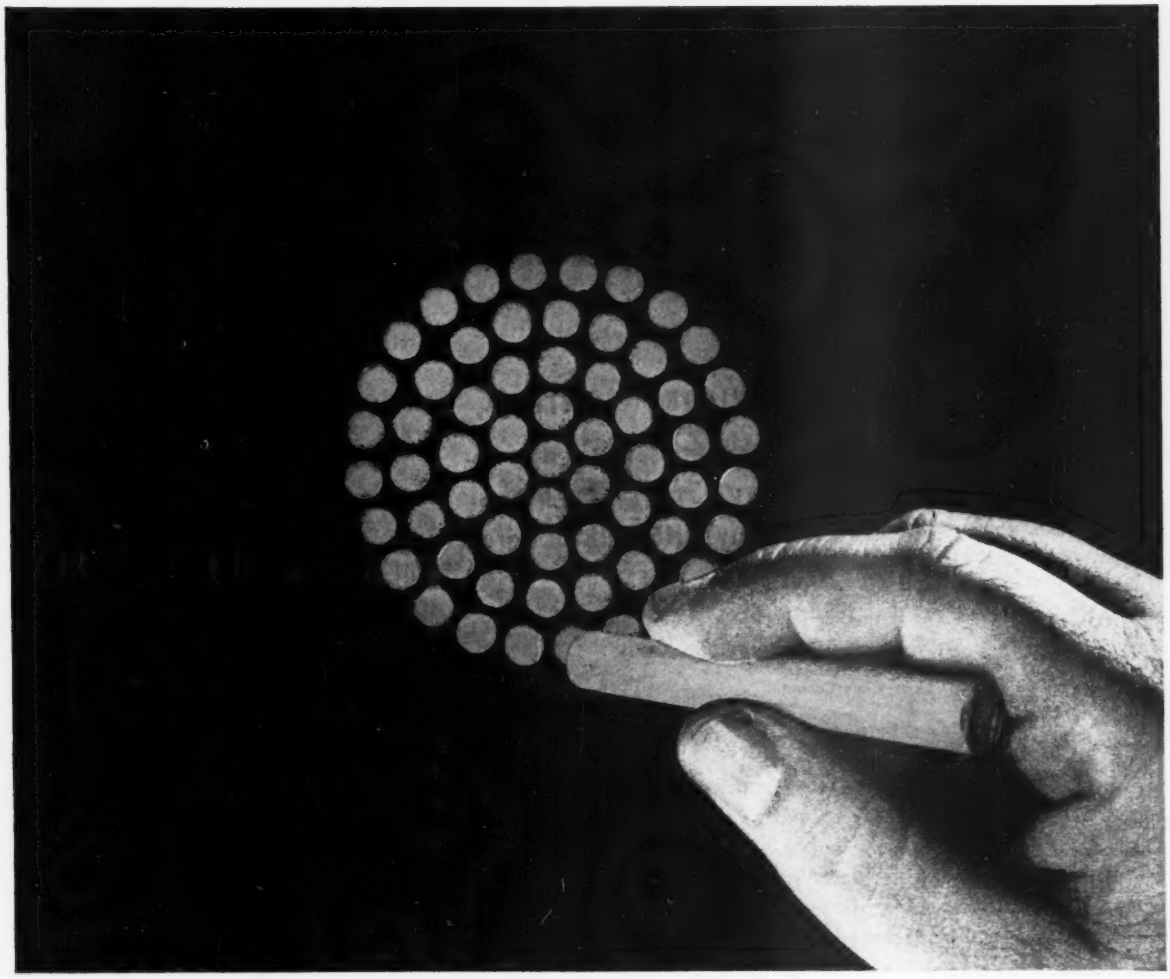
Potentiometer

Model 85196, is single-section unit with either syncro-type or screw type mount. Obtainable with either sleave or ball bearings. Standard linearity tolerance of +0.3%. Resistance values from 2,000 to 200,000 ohms at 3-w dissipation. Mechanical rotation of 360 deg continuous or stops for 330 deg rotation are available. Temperature range is −54 to +71 C.

G. M. Giannini & Co, Inc, Pasadena 1, Calif.

Multipurpose Tester

For measuring ac and dc volts, dc amps, and ohms. Available are 5 voltage ranges, 1 amp range and 4 ohm



THE ADVANTAGES OF

CABLE TYPE

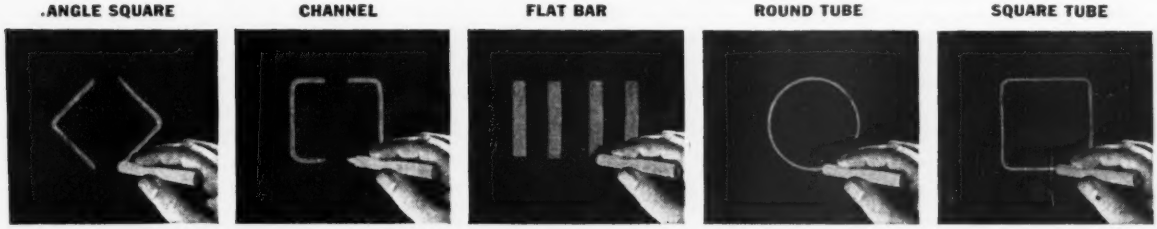
BUS CONDUCTORS

Where extremely heavy currents are required in a confined space, a bus of cable connections is sometimes more convenient than more rigid conductor shapes. Proper location of the conductor material is necessary to obtain uniform current distribution and the smallest possible voltage drop.

Arc furnaces and resistance furnaces of high capacity usually use cable connections from the main bus run to the electrodes to secure flexibility.

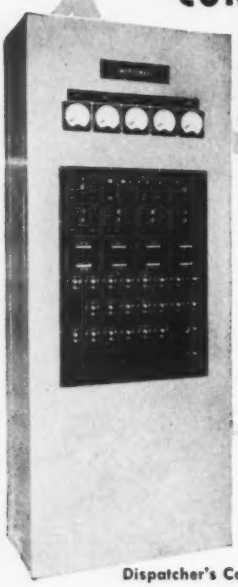
There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information concerning designs and arrangements for bus conductors. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 53128

carry the load with ANACONDA® Bus Conductors



MIDDLE ATLANTIC UTILITY
CONTROLS SUBSTATION with
DOUBLE DUTY
SUPER-TROL*

SUPERVISORY CONTROL
Plus
SELECTIVE TELEMETERING
. . . and only ONE PAIR of wires!



*Control Corporation's System of Remote Supervisory Control

Dispatcher's Control Panel

Control Corporation integrated supervisory control and telemetering equipment spans in a flash the 71 miles of leased telephone cable separating the substation and dispatching units pictured here. Over a thousand kilowatt-hour impulses are stored until called for, then transmitted to the dispatcher at his signal.

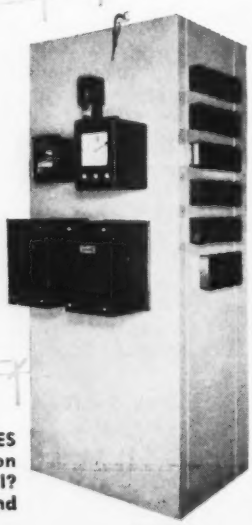
DOUBLE DUTY SUPER-TROL!

Controls and supervises . . .
- 20 Circuit breakers
- 1 Pilot trip relay
- Synchronizer fast-slow indications
- Automatic synchronizer

Supervise . . .
- 20 Circuits
- 2 Alarms

Telemeter . . .
- 8 KWH values
- 13 KVAR readings
- 13 KW readings
- 15 KV values

PLUS . . . Space for 9 additional functions . . . room to grow!



24 OF THE 28 MAJOR POWER COMPANIES are now using Control Corporation equipment. Have you tried Control? Start with our Utility Bulletin AA-2. Send for it today.

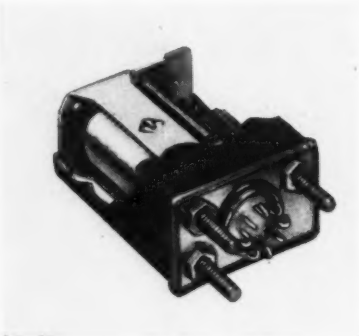
Substation

CONTROL CORPORATION
719 CENTRAL AVE. N. E. • MINNEAPOLIS 14, MINN.
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current •

ranges. Leads of 4-ft length can be plugged into either of the two pair of sockets.

Phenolic case is 8⅜ x 5¾ x 2½ in. and meter cover is made of clear chip-proof lucite. Tester, with 5-in. meter, is provided with a sturdy leather carrying case.

Martindale Electric Co, Cleveland 7, Ohio



Enclosed Relay

Of bantam-sized class "S" are hermetically sealed and measure 2$\frac{29}{32}$ x 1½ x $\frac{31}{32}$ in. Relay is designed for minimum inductance and maximum make and break speeds.

Recommended for applications wherever extremes of shock, temperature and vibration require exceptional performance. It meets Spec. MIL-R 6106.

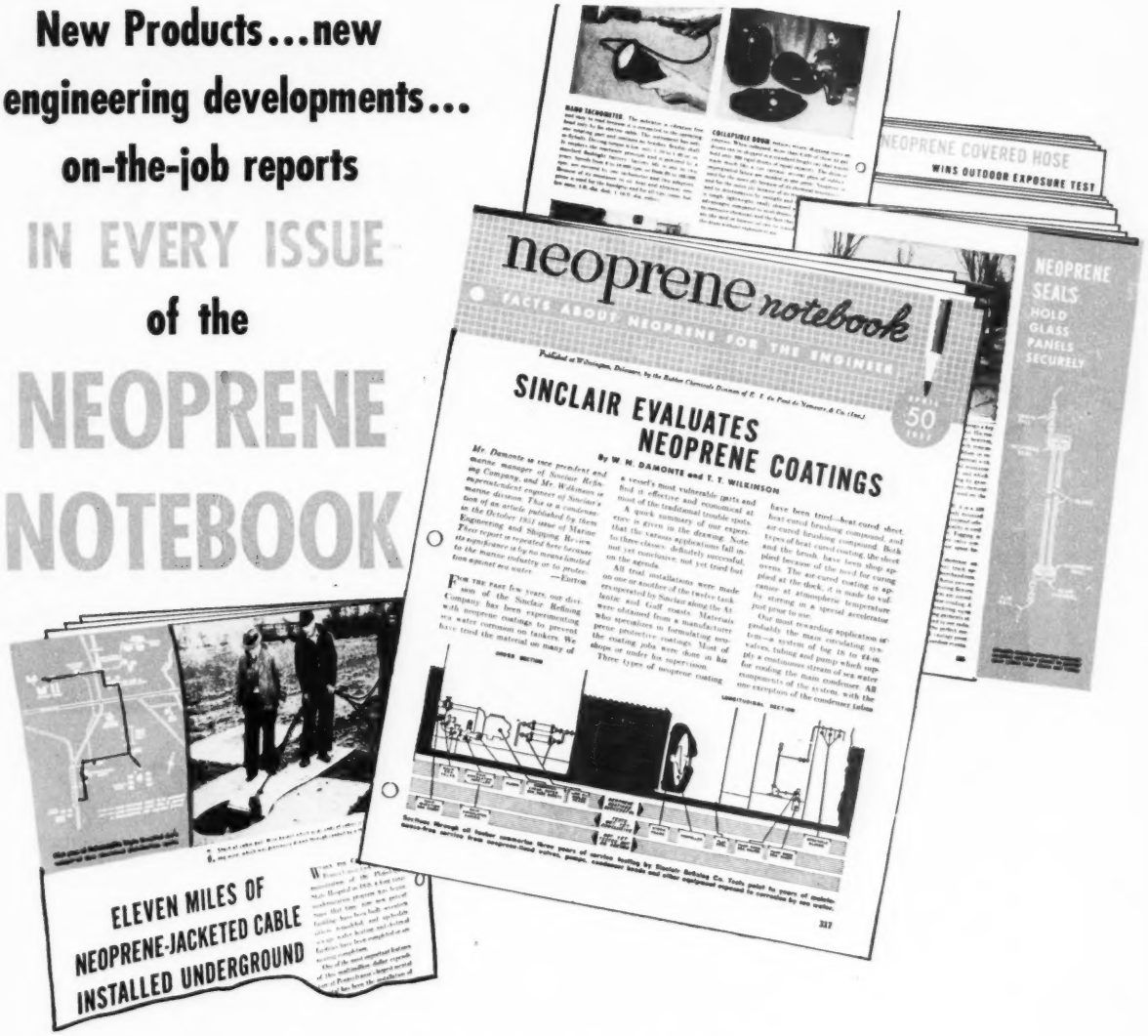
Automatic Electric Sales Corp, Chicago, 7, Ill.

Hydrocap Storage Battery

With a 3 year guarantee, eliminates loss of battery fluid by converting escaping hydrogen and oxygen gases back into water. Claimed to indicate

(*Continued on page* 240)

New Products...new engineering developments... on-the-job reports IN EVERY ISSUE of the NEOPRENE NOTEBOOK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WINS OUTDOOR EXPOSURE TEST
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SINCLAIR EVALUATES NEOPRENE COATINGS
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YOU'LL FIND profitable reading in every issue of the Neoprene Notebook.

Informative, up-to-the-minute articles report on neoprene's performance in products ranging from oil seals to conveyor belts . . . from motor mounts to work gloves. These engineering facts about neoprene are illustrated by specific data, pictures, and drawings.

Designers and design engineers find the Neoprene Notebook gives them ideas on how to use this versatile chemical rubber in designing a new product or improving an old one. Plant operating and maintenance engineers rely on the Notebook to bring them experiences of others who have solved production and maintenance problems with long-lasting neoprene products.

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Rubber Chemicals Division G-1
Wilmington 98, Delaware

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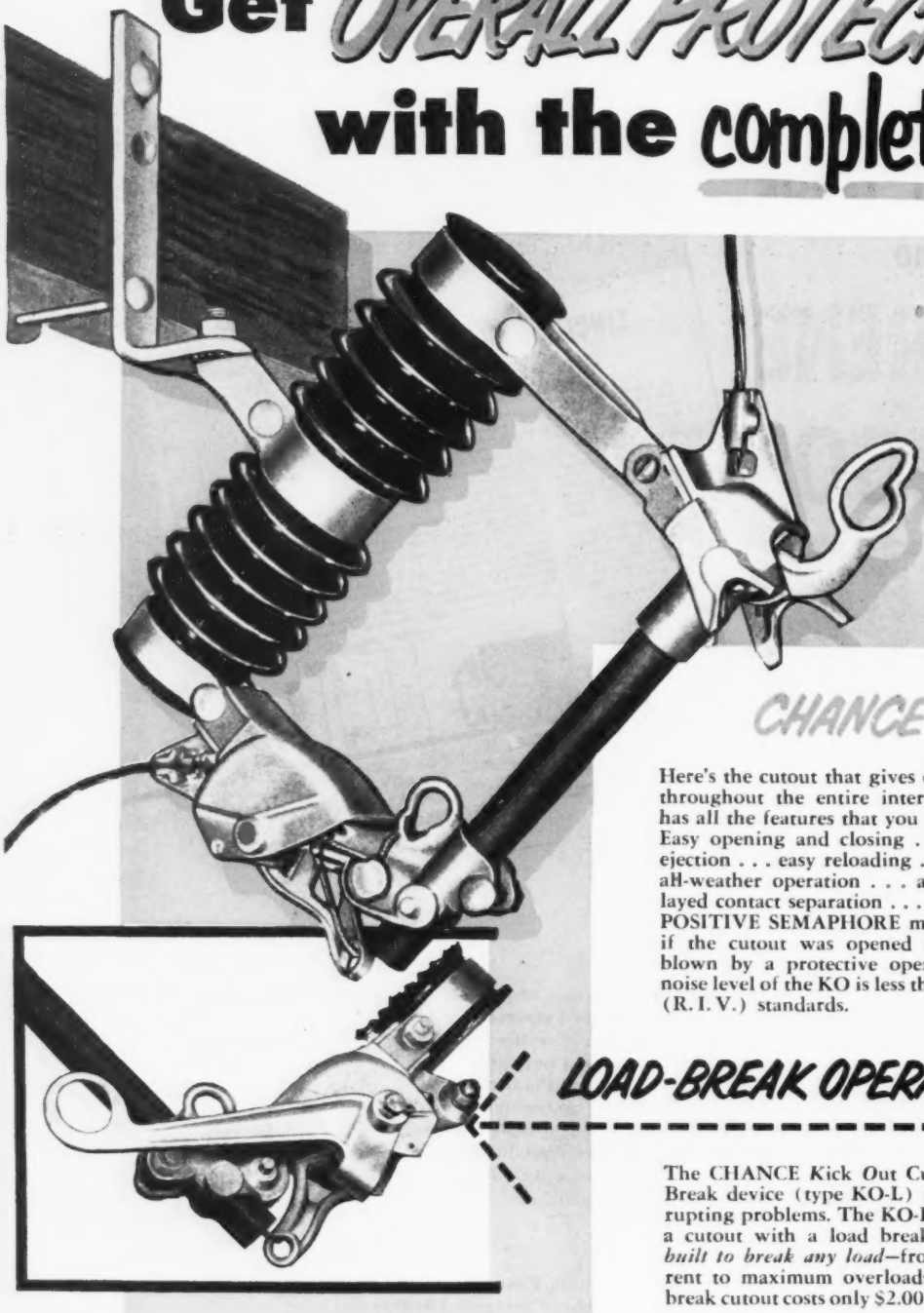
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Get OVERALL PROTECTION with the complete line



CHANCE KO

Here's the cutout that gives overall protection throughout the entire interruption range. It has all the features that you want in a cutout: Easy opening and closing . . . fast fuse link ejection . . . easy reloading . . . protection for all-weather operation . . . automatic time-delayed contact separation . . . *and* the exclusive POSITIVE SEMAPHORE method of showing if the cutout was opened manually or was blown by a protective operation. The radio noise level of the KO is less than 10% of NEMA (R. I. V.) standards.

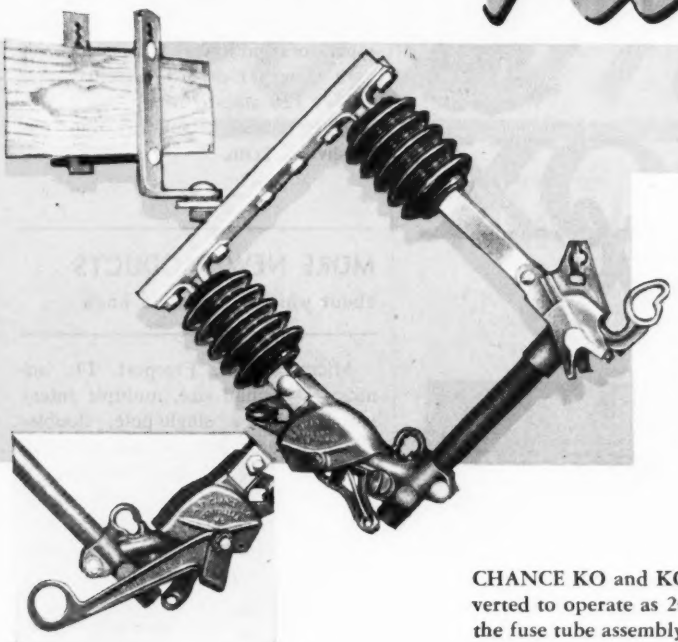
LOAD-BREAK OPERATION, TOO

The CHANCE Kick Out Cutout with a Load Break device (type KO-L) solves many interrupting problems. The KO-L is more than just a cutout with a load break attachment—it's *built to break any load*—from the lowest current to maximum overloads. The KO-L load break cutout costs only $2.00 more than the KO.

CHANCE KO-H

Now, to meet the increased capacity on growing systems, a *heavy-duty* CHANCE Kick Out Cutout (type KO-H) has been added to the line. The KO-H has a heavier fuse tube for 5000 amp interruption rating. This KO-H fuse tube may also be purchased separately for use in standard KO Cutouts to increase interrupting capacity. The CHANCE KO line is worth looking into when choosing *your* cutouts. Write for complete information today.

for today's heavier loads of CHANCE KickOut Cutouts

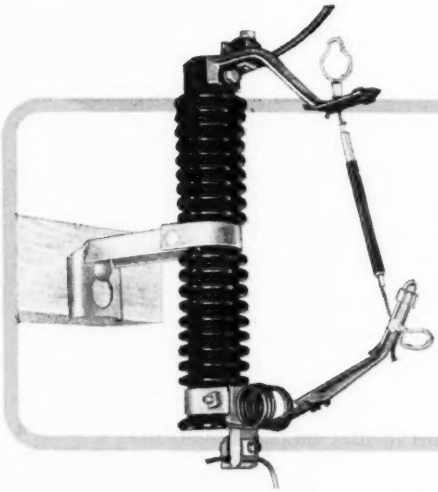


CHANCE KO-T

CHANCE also offers a double insulator type KO-T Cutout. The cutout insulators meet NEMA cutout standards. NEMA switch insulators are also available for higher flashover and greater leakage distance. CHANCE KO-T Cutouts have the same features as the KO and can also be supplied for Load Break operation.

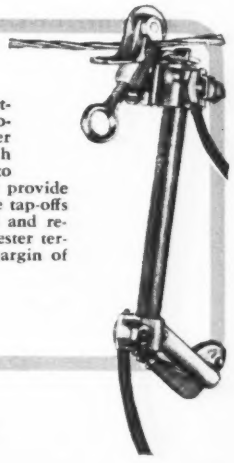
* * *

CHANCE KO and KO-T Cutouts, 7.5 or 15 KV, may be converted to operate as 200 amp disconnects by merely replacing the fuse tube assembly with a KO Disconnect Blade.



The CHANCE Cutout line also includes open link cutouts to provide inexpensive fuse protection with low R. I. V. for distribution lines. Type EM is built to function smoothly, even after hard usage and hundreds of repeated operations. It will take 1 to 50 amp fuse links.

Chance Suspension Cutouts give low cost protection for transformer installations or branch line taps on 2300 to 15,000 volt lines. They provide protection for rural line tap-offs and are easily installed and removed. A lightning arrester terminal adds an extra margin of safety for equipment.



You know it's RIGHT when you specify CHANCE

C53-1

ABC INDUSTRIES

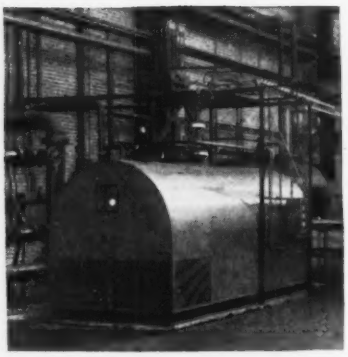
A·B·CHANCE CO·

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

Yours for REDUCED FIRE LOSSES

CARDOX Experience

The Priceless "EXTRA" You Don't Pay for in CARDOX Low Pressure Carbon Dioxide Fire Extinguishing Systems*



EXPERIENCE is the one thing that can't be copied.

CARDOX originated and created Low Pressure Carbon Dioxide Fire Extinguishing Systems many years ago.

Since then CARDOX has installed thousands of successful Systems—has held steadfastly to its never-ending research and engineering program for the continuous betterment of CARDOX fire protection.

As a result, CARDOX' experience and knowledge of low pressure carbon dioxide and its application are unapproached—literally years ahead.

This is the priceless "extra" that comes to you with every CARDOX System.

Approved by:
Underwriters' Laboratories, Inc.
Manual Systems—1940
Automatic Systems—1941

Factory Mutual Laboratories
Manual Systems—1942
Automatic Systems—1942

First Installation—1939
Thousands of Systems since, for most of the nation's leading corporations and industries.

*** Covered by U. S. and foreign patents, issued and pending.**

CARDOX CORPORATION

BELL BUILDING • CHICAGO 1, ILLINOIS • *District Offices in Principal Cities*

New Equipment

(*Continued from page* 236)

battery overcharge, dead cells and prevent corrosion of battery terminals. Returns corrosive sulfuric acid fumes to battery.

Lower specific gravity because of hydrocaps, increasing operating and shelf life and reduces shedding of plate material. Batteries with fiberglass separators and hydrocaps are available with either 51 or 57 plates having a 110 or 120 amp-hr rating.
Hester Battery Manufacturing Co, Nashville, Tenn.

MORE NEW PRODUCTS
about which you should know

Micro Switch, Freeport, Ill., announces a small size, multiple **rotary switch** with a single-pole, double-throw action. Switches are rated at 125 or 250 v, 10 amp, ac; 30v, 10 amp, dc. Three to eight units can be gang assembled . . . Induction Motors Corp, Woodside 77, N. Y., has a 60-cps, single-phase **blower,** built to U. S. Navy specifications. It is driven by a self-cooled, 1/30-hp motor designed for high temperature operation and is impregnated for humid atmosphere.

Austin-Lee, Inc, Washington 6, D. C. has a **power megaphone** with selfcontained battery power supply. It is said to weigh 5½ lb with a range of ¼ mi, and operates on a magnetic amplifier . . . McGill Manufacturing Co, Inc, Valparaiso, Ind., added a **20-amp switch** to their Levolier line rated at 125-v ac or dc. Model 2020 has a single pole, multiple-break, snap-action mechanism that breaks at four points simultaneously. UL approved.

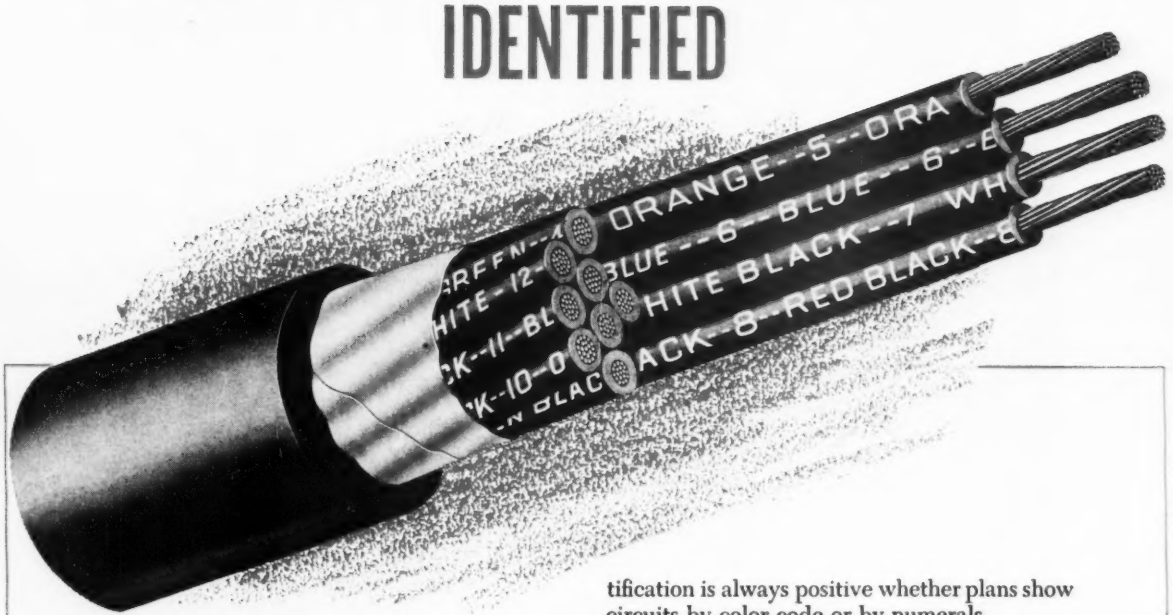
Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa., announces a motor cut-out **mercury switch** for de-energizing chart motors of Tel-O-Set recorders. Claimed to provide faster and safer instrument servicing . . . Worthington Corp, Harrison, N. J., introduces a new line of **air conditioning units.** New type units include 3 and 5-ton units for installing in forced warm air systems, and ¾ and 1-hp window units. The finish and design of the latter has been planned to fit any scheme of decoration.

Roeplastic control cable—

THE ONLY CONTROL CABLE WITH CIRCUITS

POSITIVELY

IDENTIFIED



THIS NEW Roebling ROEPLASTIC Control Cable makes circuit identification quick and certain for the first time in history. A workman can't go wrong even if he's color blind. Here's why:

In ROEPLASTIC Control Cable, each conductor is identified from end to end by both its IPCEA code color name and its individual number by means of an indelible printing against a strongly contrasting background. The printing is permanent; it cannot fade or rub off... identification is always positive whether plans show circuits by color code or by numerals.

Roebling ROEPLASTIC Control and Signal Cables are ideal for such purposes as remote control of motors, switch gear, automatic machinery, etc.... for traffic light control, relay, metering and supervisory circuits. They are made in constructions, types of insulations and over-all sheaths to meet every specific requirement. Write for technical data... and order ROEPLASTIC Control and Signal Cables from your Roebling distributor. John A. Roebling's Sons Corporation, Trenton 2, N. J.

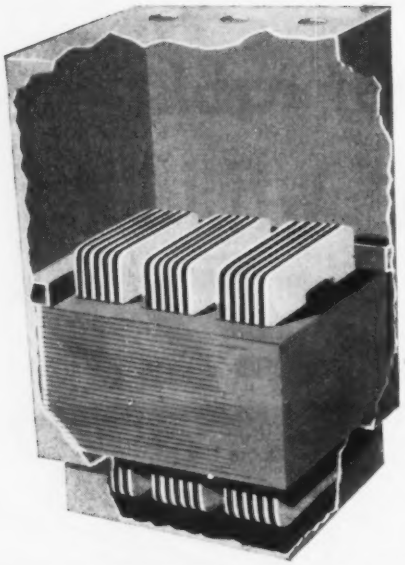
Subsidiary of The Colorado Fuel and Iron Corporation

ROEBLING

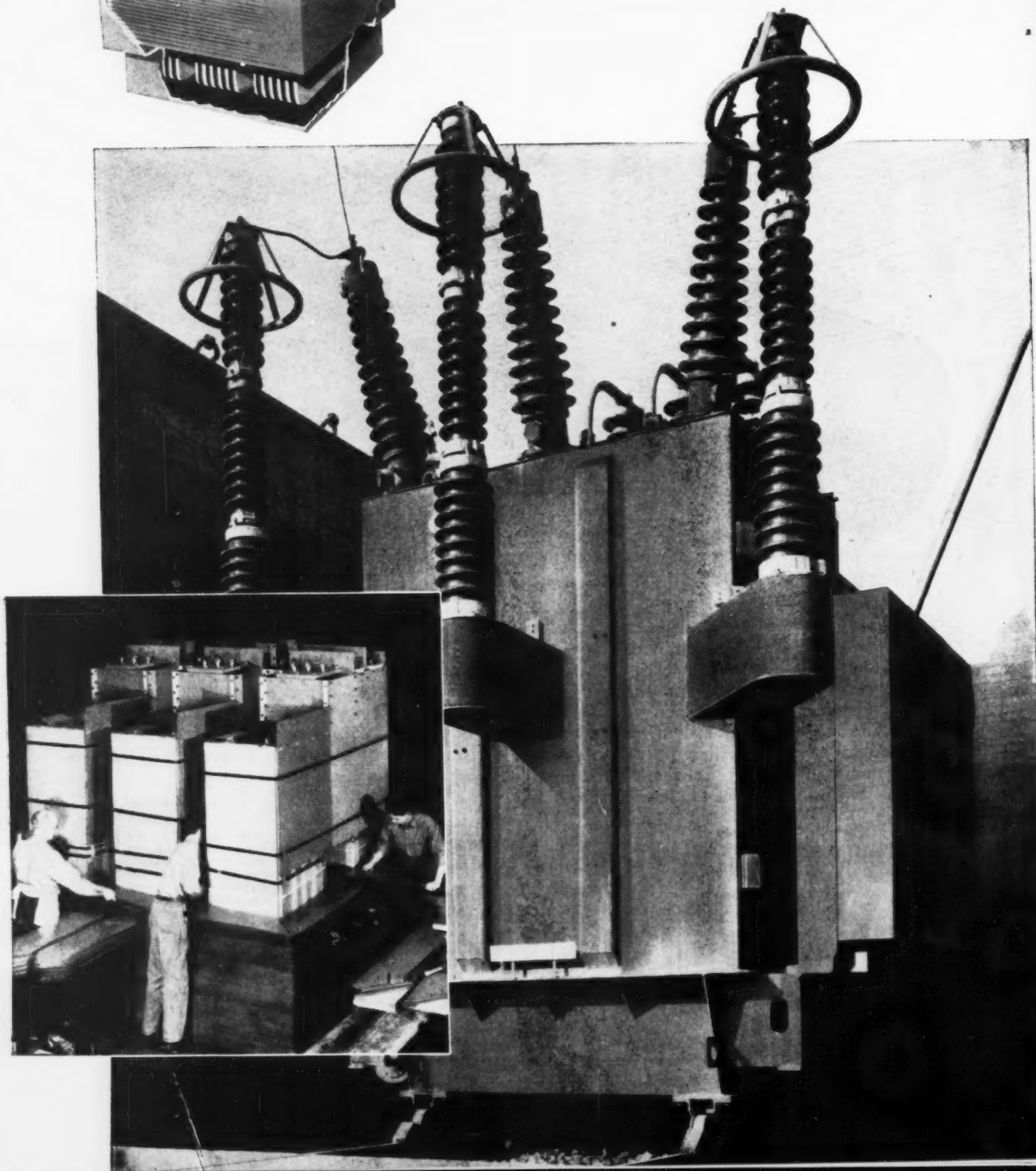
ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST & 5 PITTSBURGH ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 E. HARBOR ST & 120 S. HEWITT ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • PITTSBURGH, 1301 CLARK BLDG • ROCHESTER, 1 FLINT ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • ST. LOUIS, 3001 DELMAR BLVD • TULSA, 321 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, NEW JERSEY

CF&I

JAR ROEBLING



This design



takes stress better

The Form-Fit design of Westinghouse Power Transformers has inherent advantages that no other transformer can equal for handling both surge and short-circuit stresses.

The fact that the winding contains only a few coils of large plate area, results in the best relationship between series capacitance and ground capacitance and gives, inherently, more uniform distribution of lightning surge across the winding. This construction eliminates the need for shields, arresters or other internally mounted protective devices likely to cause trouble. As a result, operating hazards are minimized . . . design margins and safety factors are increased.

Because short circuits set up, in all transformers, magnetic fields that tend to force high and low-voltage coils apart, Westinghouse Form-Fit Transformers are arranged with high and low-voltage coils interspersed, so that these forces, acting over broad areas, essentially balance each other and are reduced to absolute minimums. Furthermore, because the core surrounds, supports and protects the coils, the mechanical strength of the mass of core material is added to the strength of the case, providing an unbeatable combination to withstand all mechanical stresses.

To all this, add the advantage of more efficient cooling, and the saving in installation cost because they are smaller and lighter than any comparable transformer, and you'll quickly see why it pays to specify Westinghouse Form-Fit Power Transformers.

Ask your Westinghouse representative for further information, or write for Booklet B-4142A: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70643

YOU CAN BE SURE...IF IT'S
Westinghouse
POWER TRANSFORMERS

50,000-kva, 132-kv transformer installed at West Penn Power Company's Mitchell Station.

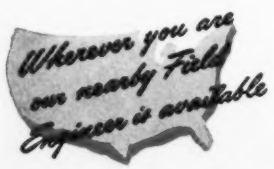
SOLDERING ARMATURE COIL LEADS

without a Soldering Iron?

Soldering armature coil leads to risers with National-designed induction heating equipment in the National plant.

Soldering armature coil leads to risers by hand leaves a lot to the human element. So three years ago, National developed a way to solder by induction heating. It's quicker.

More uniform. *Reduces liability of premature trouble.* If you've wondered why a motor or generator repaired or redesigned by National gives such excellent service . . . it's the "little" things like this which National does, unheralded and unsung, that count so much. They mean a lot *in the long run.* Use National coils and engineering service for the unannounced advances which add so little to cost, so much to value.

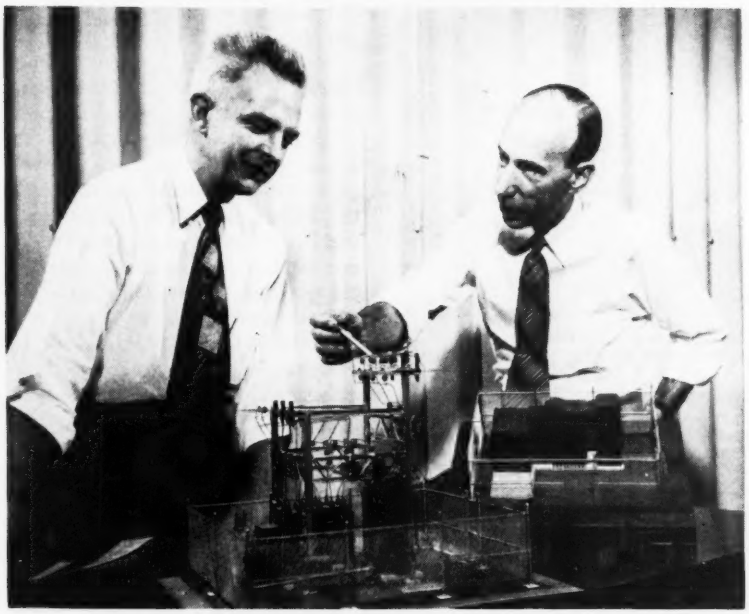


NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

LETTERS TO THE EDITOR



PENNSYLVANIA P&L MODELS inspired EW article. Now . . .

J. D. Graver Adds Some Details

To the Editor:

The article by Mr. W. B. Morton, "Models Save Time, Money, Equipment and Manhours in Utility Design and Construction," which appeared in Electrical World, Nov. 3, 1952, aroused a great deal of interest. As a result of requests which we have received concerning the types of materials and methods used in constructing these scale models, I should like to present briefly the entire procedure from the time of the original request for the model to the finished product.

After authorization has been given to construct a model, the model-maker and the engineers delegated to this particular project get together to talk over the job in a general way and to decide on the scale to be used. Next, preliminary drawings, including manufacturers' outline drawings of equipment to be used on the project, are prepared and given to the model-maker. From these drawings, he makes up his own scale drawings of individual items of equipment, structures, etc. These scale drawings are made on heavy cardboard to be used as a form of jig for assembly.

Individual structures and all items of equipment are then built. Steel structures of basswood cut in standard structural steel shapes are glued together with ordinary airplane cement. These wood shapes are generally available, in 24-in. lengths, at most hobby shops. The complete assembly is then sprayed with aluminum paint and presents the appearance of a very real miniature steel structure. Since none of these items of individual equipment is commercially available, each must be handmade.

Most of the equipment is of wood, including wood turnings for insulators and bushings, and built-up wood blocks. In some cases, wooden beads can be utilized in making up insulator assemblies. Fencing is duplicated in miniature by cutting ordinary fly screening on the bias, with fence posts and rails made of small diameter brass tubing soldered together.

The entire project is assembled on a suitable plywood base reinforced with 1″ x 1″ wood strip on the underside to provide rigidity. A cover, with hinged legs which fold inside, is designed to serve both as a display table for the model and also as a protective cover for shipping and storage when not in use.

It should be kept in mind that during the entire operation, from beginning to end, many discussions are held to evaluate the criticisms and suggestions made by engineers, operating personnel, and the model-maker.

To obtain the full value of the model, the model-maker himself should have some years of field experience with the utility design and construction. He will then be familiar with the standards and practices and will be on the alert for suggesting improvements in design, clearances, and simplified construction. These items are of great importance in effecting economy along with the most satisfactory design.

The scale model is now recognized as another important tool in industry.

J. D. Graver
Pennsylvania Power & Light Co
Allentown, Pa.

● Mr. Graver has made most of the models described in the original article, and now heads the recently authorized model shop of Pennsylvania Power & Light Co.

Feeder vs Bus Regulation

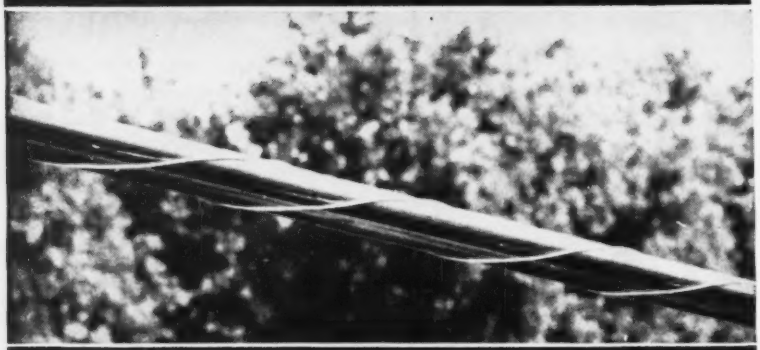
To the Editor:

In the Dec. 1 issue "Technical Notes" stated, "Voltage regulators cost three to four times as much per kva in the sizes commonly used on feeders as for the larger sizes appropriate for bus regulation."

The statement, as it stands, is approximately correct within broad editorial limits. However, consider as an example a popular size 7500-kva station at 4330 volts. A 7500-kva bus regulator compared with 200-amp feeder regulator shows ratios of 2.0 with three-phase step voltage regulators in the feeders, 2.4 with single-phase induction regulators in the feeders. One has to assume approximately 20 feeders from a 7500-kva substation to approach the ratios referred to in the "Notes." This is an absurd application assumption.

It has long been recognized that the cost per unit of apparatus becomes smaller as the rating is increased. This is true whether one is referring to switchgear, generators, motors, transformers, or regulators. This observation of the well known laws of manufacturing is all that is covered in the "Notes." The major point, not mentioned, to be considered is the quality of regulation obtained when one compares bus versus individual feeder regulation and the

SPIN CABLE LIKE THIS . . .



THROUGH TREE-CONGESTED AREAS AT MUCH LESS COST . . .

You can save man-hours of wood-cutting and customer complaints when you spin cable through tree-congested areas. What is more, spun cable costs much less to install than pre-assembled cable. Spun cable is so compact that it saves valuable space wherever congestion is a problem.

You save splices and installation labor, because light weight single conductor cables may be spun in lengths three times as long as pre-assembled cables.

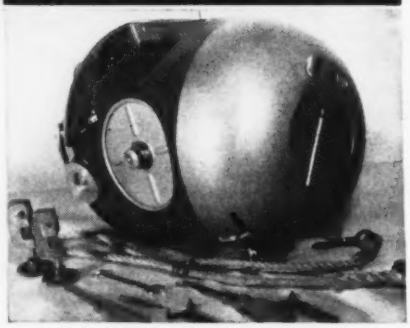
You reduce your cable inventories, because 1/c, 2/c and 3/c cables can be spun in the field as required.

Add to these benefits the extra margin of protection against storm damage . . . and you readily understand why there is a marked trend to cable spinning in the power field.

with NEALE Model "K"

HOW IT WORKS

Drum rotates when its two friction drive wheels respond to pulling of wire. Drum revolves once when 13" of wire is pulled — regardless of condition of strand. Drum carries two spools of wire, each spirals 13" giving support every 6½". Magnesium castings used wherever possible for lightness and strength. Weight: only 36 lbs. Overall length: 18½".



THE WORLD IS SPINNING—TOO!
PHONE 2-7734-5

Cable Spinning Equipment Co.

3100 TOPEKA AVE. TOPEKA, KANSAS

ultimate individual phase control of each feeder.

If one would compare the cost per horsepower of a Ford and a Cadillac, it would be noted that the cost per horsepower of the Cadillac was greater. However, the user rationalizes the increased cost based on the quality of performance. In a similar manner the users have long recognised the higher cost of individual feeder regulation and have accepted this increased cost because of the improved voltage regulation available to the ultimate consumer.

Please don't make it difficult for planning engineers to do good engineering.

J. W. Butler
Manager-Marketing
Power Transformer Dept
General Electric Co
Pittsfield, Mass.

To the Editor:

I want to thank you for sending me the AIEE paper which was the basis for the "Technical Note" item in the Dec. 1, 1952 issue, to the effect that feeder regulators cost 3 or 4 times as much as bus regulators.

I have reviewed Mr. Mendenhall's paper presented to the 1951 AIEE Winter Meeting and find that for data obtained from 1950 manufacturers' catalogs the cost of regulators is approximately correct.

However, for data taken from 1952 catalogs the picture is quite different.

Even with the obsolete price data it is obvious from Fig 3 of Mr. Mendenhall's paper that the cost ratio of 3 or 4 to 1 for "small" versus "large" regulators existed for only one specific size of regulator, and the ratio in no way represented that found on the average system nor even on the system studied in Mr. Mendenhall's paper.

A much more up to date comparison of regulator and regulation equipment costs was given in a paper presented by Mr. W. L. Peterson at the AIEE Northeast District meeting last winter.

Since many people are now using—or making plans for using—regulators, who have had little or no engineering experience with them, we believe it is important to keep the basic economic thinking as accurate as possible.

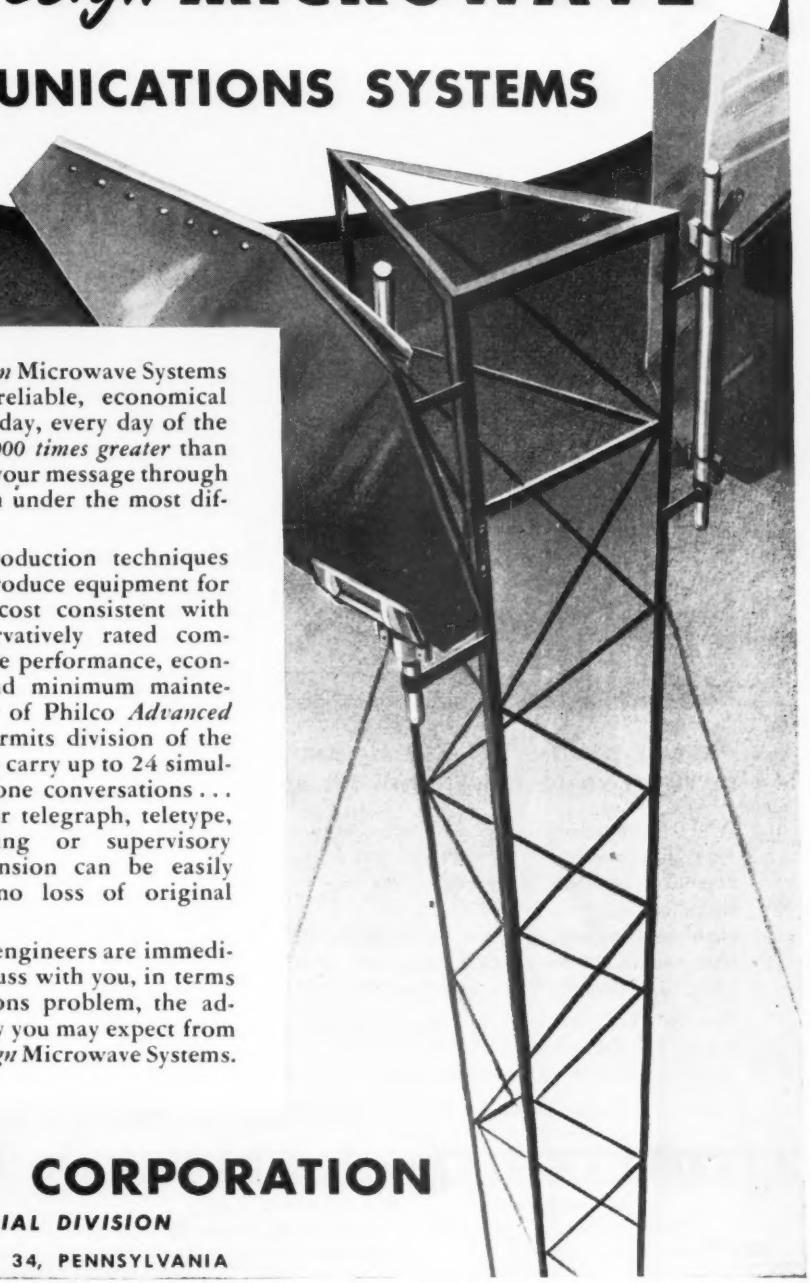
G. W. Clothier
Manager, Transformer Section
Allis-Chalmers Mfg Co
Milwaukee, Wis.

Don't Settle for Less Than . . .

PHILCO

Advanced Design MICROWAVE

COMMUNICATIONS SYSTEMS



Philco *Advanced Design* Microwave Systems are engineered for reliable, economical operation 24 hours a day, every day of the year. A signal level *1000 times greater* than normally needed gets your message through clear and strong, even under the most difficult conditions.

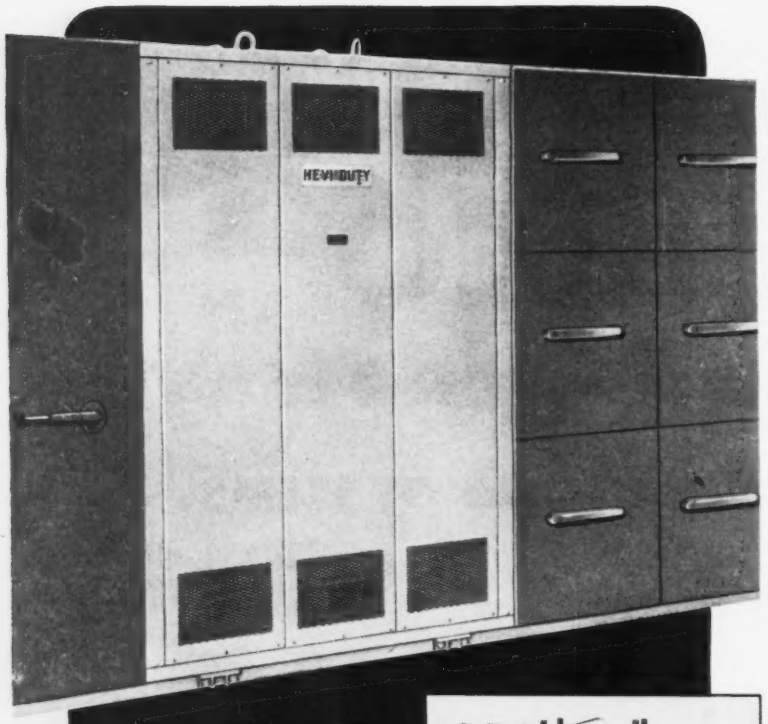
Philco's exclusive production techniques make it possible to produce equipment for the lowest possible cost consistent with high quality. Conservatively rated components insure reliable performance, economy of operation and minimum maintenance. The flexibility of Philco *Advanced Design* Microwave permits division of the broadband channel to carry up to 24 simultaneous 2-way telephone conversations . . . or further division for telegraph, teletype, telemetering, signaling or supervisory circuits. Future expansion can be easily accomplished with no loss of original investment.

Philco regional sales engineers are immediately available to discuss with you, in terms of *your* communications problem, the advantages and economy you may expect from Philco *Advanced Design* Microwave Systems.

PHILCO CORPORATION

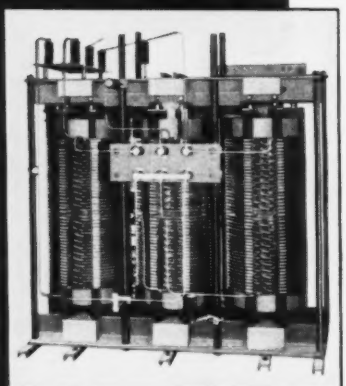
INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA



HEVI DUTY

High Voltage Unit Sub-Station Transformers



INCREASE EFFICIENCY OF LIGHTING AND POWER CIRCUITS BY SUPPLYING EQUIPMENT WITH THE CORRECT VOLTAGE

When you need electric power, you can count on Hevi Duty Dry Type Transformers for dependable service. These transformers are engineered to meet or exceed all the requirements necessary for long life.

Note the adequate core and coil blocking, high voltage insulators and well ventilated pancake type coils on the Type 31FH, 300 KVA, 13,200-208Y/120 volt, 60 cycle Transformer shown here.

Hevi Duty Dry Type Transformers can be supplied separately or as a Unit Sub-Station complete with primary and secondary switch gear according to your specifications.

Write for Bulletin HD-499.

HEVI DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers ***Constant Current Regulators***

WHAT THEY'RE SAYING

At Industry Meetings

Natural Rubber Reign Broken

JOHN P. COE, vice president and general manager, Naugatuck Chemical Division, U. S. Rubber Co, on the tenth anniversary of their plant at Naugatuck, Conn.

In the short space of a decade, chemical research has broken the century old reign of natural rubber as the single basic raw material of the rubber industry. This industry now has hundreds of raw materials that can be tailormade to fit exacting requirements. This has been due primarily to the stimulus of chemical research and development which has brought synthetic rubber up from the status of a warborn substitute to a point where it is in large demand on its merit in addition to any considerations of price, availability, or national defense.

Responsibility to the Public

RALPH J. CORDINER, president, General Electric Co, before a company management conference at Chicago, Ill.

Any and every corporation in America has a great responsibility to the public and we must always recognize that our objectives are a part of the American scene and will be judged as to whether they are socially and economically beneficial to the people.

The electrical industry will produce as much electrical equipment in the next ten years as was manufactured in the past 74 years. By 1961 the generated capacity should be 159 million kilowatts, more than double the total installed capacity as of 1951.

Theatre TV Endorsed

COMMANDER E. F. McDONALD, JR, president Zenith Radio Corp, before a group of distributors.

We need theatre TV on a truly national basis so that great events of national interest can be seen by millions of people who either can't afford or for some other reason do not own television sets. However theatre television should not have a monopoly on great events.

Even if every movie theatre in America were equipped with TV they alone could not serve the public adequately when great national events

all this adds up to

LOWER MAINTENANCE COST

for you

The finest in engineering and manufacturing "know how" is in back of every KNOX Electrical Porcelain Insulator. Take for example the KNOX Suspension Insulator illustrated above ...compare it feature for feature with any other and you will find the reason why KNOX represents the finest in electrical porcelain insulators. Write for catalog showing the complete KNOX line.

KNOX PORCELAIN CORPORATION

KNOXVILLE 1, TENNESSEE

What we want are clean treated poles that we can count on for *long* service!
Then you should use *creosote*. Proper pressure treatment combined with creosote of the proper specifications will give you dry, complaint-free poles that are *completely protected* against decay.

Remember . . . creosote is the *only* preservative that has kept wood sound and serviceable under severe conditions for more than 30 years.

KOPPERS COMPANY, INC., PITTSBURGH 19, PA.
Tar Products Division
DISTRICT OFFICES: Woodward, Ala. · Chicago, Ill., 122 S. Michigan Ave.
New York, N. Y., 350 Fifth Ave. · Boston, Mass., 250 Stuart Street
Los Angeles, Calif., 727 E. Gage Ave. · Pittsburgh, Pa., Koppers Building

KOPPERS
All Standard Specifications
Creosote
The Performance-Proved Wood Preservative

You can count on Koppers for Creosote!

are televised. Despite the fact that over the past forty years the movie industry enjoyed great prosperity there are only twelve million movie seats in this country to serve a one hundred and fifty million population.

Billion Dollar Renewal Market

H. F. BERSHE, renewal sales manager, tube dept, RCA Victor, before the World Annual Convention of the National Electronics Distributors Association at Atlantic City, N. J.

To meet the renewal requirements of this rapidly developing "Electronics Age" the electronics distributing industry will be required within the next three years to grow two-thirds larger than it is today. In the future the industry will be blessed with a strong tailwind and it will be manufacturing electric air conditioners, electronic ignition systems, and many other revolutionary devices.

Business Looks for "Even Break"

JAMES H. JEWELL, vice president in charge of sales, Westinghouse Electric Corp before the Rotary Club of Trenton, N. J.

Because many of the advisers of the new president are businessmen, I think that business can expect equitable treatment from the national government. I also believe that business can expect no favors from the administration and it will be more than happy to settle for this "even break."

The expansion record of the utilities has been greater than that of any other industry. From 1946 through 1951 approximately ten billion dollars was spent to increase generating capacity fifty percent. Another eight billion will be spent by 1954 resulting in a net increase of capacity of one hundred percent over 1946. Plans are now being formulated to triple the 1940 capacity by 1957 when 120 kilowatts will be available.

Key to Canadian Growth

HERBERT H .ROGGE, president, Canadian Westinghouse Co, before the Electric Club at Toronto, Canada.

The development of low cost electric power is the most important single factor in Canada's growth. The annual investment in power development has increased from $31,000,000 in 1939 to $345,000,000 in 1951, nearly eleven times. We are destined

Coupling Conduit? it's easy...

with an O.Z. Split Coupling

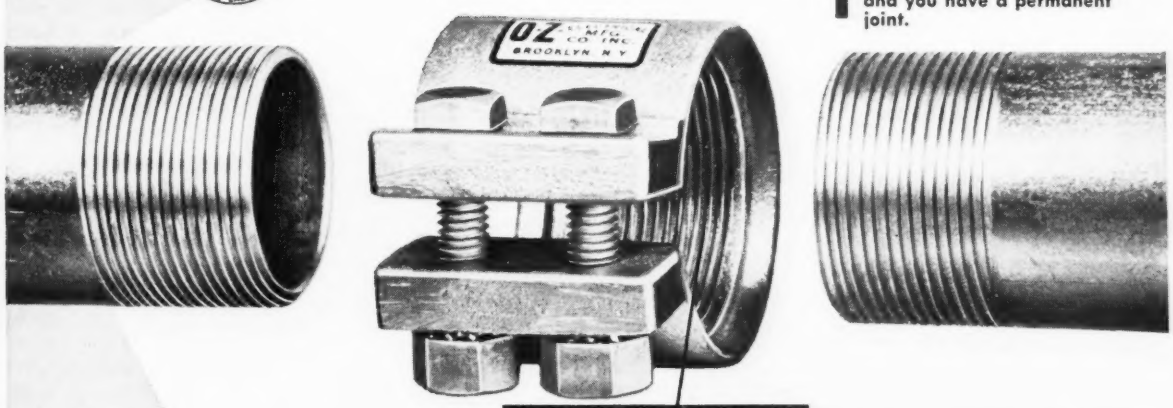
UL Approved

THESE YOUR PROBLEMS?

Not enough space
No room for wrench
Hard to get at
Conduits can't be turned

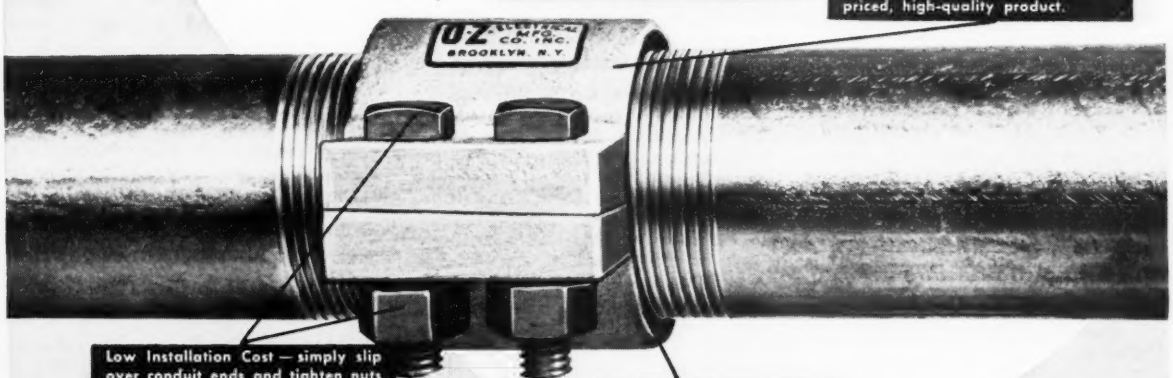
HERE'S YOUR ANSWER!

O. Z. is the simple, dependable way to couple conduit. Just butt the conduit ends within the opened O. Z. Split Coupling, tighten two nuts and you have a permanent joint.



Interior Threading — meshes with conduit threading for a rigid close-fitting connection.

Low Price — simple, one-piece malleable iron construction assures low-priced, high-quality product.



Low Installation Cost — simply slip over conduit ends and tighten nuts to close fitting. Bolt head is held in place by coupling shoulder.

Available for conduit sizes ranging from ½" to 5".

8192

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.
262 BOND STREET · BROOKLYN 2, N. Y.

Your local O. Z. distributor is ready *now* to serve you from stock. Get in touch with him for further information on the complete, dependable O. Z. line of electrical fittings.

CONDUIT FITTINGS · CABLE TERMINATORS · GROUNDING DEVICES
CAST IRON BOXES · SOLDERLESS CONNECTORS · POWER CONNECTORS

News about

B. F. Goodrich Chemical ***raw materials***

CHECK THIS TABLE

See why GEON RESIN 404 provides improved jacketing and insulation

PROPERTIES OF IMPORTANCE TO THE ELECTRICAL FIELD

ELECTRICAL PROPERTIES	
Insulation Resistance megohms—1000 ft., @ 50°C—½" wall	20,000—35,000
Dielectric Strength (v/mil) @ 25°C in air	
¼" wall	1,200—1,300
½" wall	800—1,000
Power Factor @ 1000 cps @ 25°C	.015—.02
Dielectric Constant @ 1000 cps @ 25°C	3.0—3.2
Loss Factor @ 1000 cps @ 25°C	.045—.064
PHYSICAL PROPERTIES OF WIRE INSULATION	
Tensile Strength #/sq. in.	6,500—8,500
Elongation—%	15—25*
Hardness—Durometer	82D
Specific Gravity	1.35—1.45
Low Temp. Flex 2 hrs./°F (6 turns around .3 mandrel) passes	−70°
Heat Stock—1 hr./120°C	OK
Air Oven Aging—7 days @ 100°C—% Retention of Elongation	100
Cutting Resistance @ 50°C (lbs. thru .032" wall) .025" conductor	>66
Cutting Resistance @ 70°C	47.5
Compression Strength @ 25°C (lbs./2 in. length)	8500
Deformation (½" wall, 1,000 gm. wt. on ⅜" ft.) 1 hr. @ 120°C	25%
Abrasion Resistance** Taber Abrader (60 D2R)	
5000 rev—weight loss	.085gm.
volume loss	.060cc

* Jaw separation—1 inch/min.
** Run on tensile sheets

THIS table tells you why rigid insulation and jacketing based on Geon Resin 404 provides an entirely new approach to the use of vinyls on wire and cable. Geon Resin 404 has electrical properties even superior to those obtained with normal plasticized polyvinyl chlorides . . . because it is *especially designed* for use without plasticizer.

Possessing all the physical and electrical properties of straight polyvinyl chloride, Geon Resin 404 can be processed without plasticizer addition on standard equipment.

Consult your wire and cable supplier

For comparison, check the properties of a standard vinyl compound with those of Geon 404 listed in the table. Then consult your wire and cable supplier about your insulation and jacketing requirements. You'll find Geon Resin 404 provides advantages heretofore unattainable. For further information, write for Bulletin G-6. Please address Dept. GJ-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

IMPORTANT NOTE! Geon compounds have the Underwriters' Laboratories approval for use as Type T insulation on aluminum wire.

GEON RESINS • GOOD-RITE PLASTICIZERS...the ideal team to make products easier, better and more saleable

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers. HARMON organic colors

to use these tremendous power resources for our expanding industrial economy. Hydro-electric power is a resource that continuously renews itself and is never exhausted.

Best Defense Is Constant Growth

B. K. WICKSTRUM, vice president and sales director, Sylvania Electric, before the general sales conference of the Southeastern Electric Exchange at Birmingham, Ala.

The best national defense is the constant growth of our electric power resources and with the increasing of this power supply we can turn out on time the military supplies needed to win in the event of aggression. In time of peace we need power to improve our productivity so that goods will cost less to make and therefore the purchasing power of an hour of labor will be increased. In this way our standard of living will continue to rise.

American power production has more than doubled every ten years, and the current consumption rate is 350 billion kilowatt-hours a year and twice that is 700 billion kilowatt-hours and the time is 1962. In order to get mass distribution of electric power, means must be taken to get small electrical appliances moving faster, thereby helping to develop the radio-television market, undertaking relighting programs, and working with industry for new developments in the heavy equipment fields. An electric utility's policies aimed at increasing sales volume of power should include such features as market research programs to uncover the facts that will establish the salesmen's goals; a compensation program for salesmen that "brings better men and a better-sold product"; and sales budgets calculated to help the salesman in every way, advertising, promotion, facts, prospects, training, and good supervision.

'53 Market To Be Stable

WILLIAM COLLINS, president, Walter Kidde Constructors, Inc.

The prospect of intensified competition in most fields of production is likely to maintain a steady demand for industrial engineering and construction services throughout 1953. The completion of many post Korean defense plants will probably result in a period of temporary adjustment among companies specializing in the design and construction of industrial facilities.

Controlled Selling of a Controllable Load

THE TRUE STORY BEHIND *Glassheat*

TRADE MARK
BY CONTINENTAL

THE MOST ECONOMICAL HEAT BY ELECTRICITY

Whenever a product comes into general use that is so outstanding and remarkable that it threatens to revolutionize public opinion in regard to a daily household problem, it is bound to stir up some controversy. It is accordingly not surprising that in the tremendous amount of discussion relative to GLASSHEAT, some misconceptions have come to light — even into print.

Everyone should know these facts behind the GLASSHEAT story:

1. In installation after installation, verified reports show that GLASSHEAT by Continental, when operating in a properly insulated building, compares favorably costwise with any other good heating system.

2. GLASSHEAT meets the public demand for a better, healthier, more flexible heating system that can be installed at low cost and maintained indefinitely at practically no expense. *Continental will guarantee public satisfaction through engineered installation which will not be made until checked and approved by the local utilities.*

3. Continental Radiant Glass Heating Corporation, America's leading manufacturer of electric heating equipment, *cooperates* with utility companies in the *controlled* selling of GLASSHEAT units.

4. Controlled selling of GLASSHEAT installations means *higher utility profits, greater consumer benefits, and continued good customer relations.*

5. Continental has made thousands of new GLASSHEAT installations during 1952. The overall reaction of utility companies in the areas where these installations have been made has been not only favorable but enthusiastic.

The modern homeowner and businessman know about and are interested in buying GLASSHEAT. Certainly it is only fair that both the general public, and management of utility companies should know the full story, the true story, of what GLASSHEAT is, what it can do, and how much it costs.

CONTINENTAL RADIANT GLASS HEATING CORP.

1 East 35th Street
New York City, N. Y.

NEWS ABOUT PEOPLE

Lewis Named Vice President

New York State Electric & Gas advances the newly elected official from post of general operating superintendent

DAVID A. LEWIS

David A. Lewis has been elected vice president in charge of general operations of New York State Electric & Gas Corp. In his new capacity, Lewis will report to Arnold W. Milliken, vice president and general manager. His headquarters will remain in Binghamton.

Lewis, who has been general operating superintendent since 1949, now will be responsible for the company's following staff functions: Engineering of generating plants and electric and gas transmission and distribution facilities; system power supply and operation; purchasing and stores; and the meter and transportation departments. He will also have direct supervision over all major construction work of the company.

Began as Distribution Engineer . . . The newly elected official was employed by Public Service Co of Northern Illinois before joining New York State E&G in 1925 as a distribution engineer. He was named operating superintendent of the Geneva area in 1931, continuing in that capacity until 1941 when he was appointed operating superintendent of the company's Western Division with headquarters in Lancaster.

He was made manager of the Eastern Division in 1946 with headquarters at Brewster. He became assistant to Milliken in 1947 and was appointed to the superintendent's post two years later.

Lewis graduated in 1923 from Pennsylvania State College, where he received an electrical engineering degree.

•

Samuel K. Hostetter, Jr, has been named sales manager of the Crocker-Wheeler Division of Elliott Co at Ampere, N. J. For the past ten years Hostetter has served as manager of the Washington (D. C.) office, where he supervised Elliott sales activities.

Donald E. Williams, assistant secretary of Cleveland Electric Illuminating Co since 1948, has been elected secretary of the company. Williams succeeds **Sydney L. Hall,** who has resigned to become vice president of Clevite Corp, Euclid, Ohio. **Frederick C. Prasse,** counsel in the utility's law department, replaces Williams as assistant secretary. **Dr T. Keith Glennan,** president of Case Institute of Technology, has been named to the board of directors of CEI to succeed **Dr Zay Jeffries,** who has resigned.

Harold K. Williams, district manager for Pennsylvania Electric Co at Meadville since 1942, has been appointed assistant operating superintendent of the utility's Northwestern Division with headquarters at Erie. **Joseph P. Callahan,** industrial sales engineer at Meadville, succeeds Williams as district manager. Williams joined Penelec in 1924 and Callahan in 1922.

Arnold I. Thorsen, works manager of Allis-Chalmers Manufacturing Co's Norwood Works, has been made assistant director of manufacturing of the company's General Machinery Division. In another appointment, **Henry F. Banzhaf** has been named to the newly created post of manager of sales of Allis-Chalmers' control operation at its Hawley Works.

Thomas P. Leddy, formerly vice president and general manager of Federal Electric Manufacturing Co, Montreal, Can., has been elected assistant vice president of Kellogg Switchboard & Supply Co, Chicago. Assigned to the staff of Vice Pres and Sales Manager F. M. Parsons, Leddy will coordinate activities of Kellogg's government sales department. Both companies are in the International Telephone & Telegraph Corp system.

George E. Lambert has been named manager of Westinghouse Electric Corp's Lamp Division plant at Fairmont, W. Va. Lambert, who has been administrative assistant on the staff of the division's vice president at division headquarters at Bloomfield, N. J., joined Westinghouse in 1941.

Elbert C. Brown has returned to his post as assistant to the president of Hartford (Conn.) Electric Light Co after a nine months' leave to serve Defense Electric Power Administration as assistant to the director of the Power Supply Division.

WARDE B. STRINGHAM

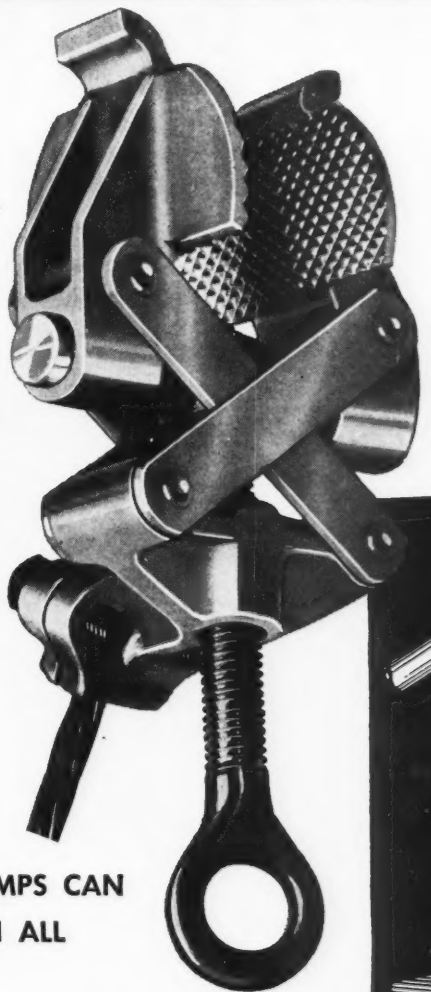
Stringham Made a VP by General Electric Co

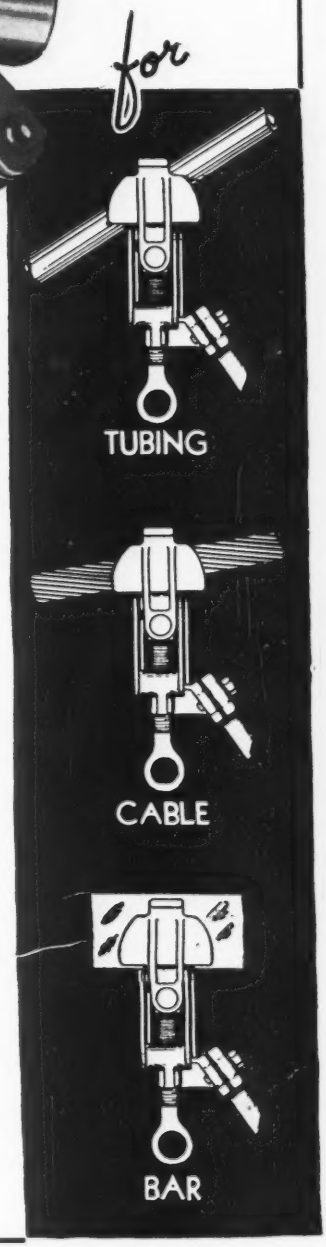
Warde B. Stringham has been elected a commercial vice president of General Electric Co in Washington, D. C. Stringham succeeds Edwin E. Potter, who has retired after 43 years' service.

Stringham, executive assistant to Potter, was Washington district manager for the General Electric Supply Corp for 13 years. He was named a commercial vice president of that company in 1951. He left the supply firm last year to join Potter in the operation of the government business

Speed in Grounding

with ONE grounding clamp instead of MANY





MEMCO "VERSI-TAP" CLAMPS CAN BE USED *AT ANY ANGLE* ON ALL CONDUCTOR SHAPES

Save valuable time by using MEMCO VERSI-TAP GROUNDING CLAMPS for all *station* grounding operations. Versi-taps are designed to grip conductors of any shape, such as cable, tubing, or bar. They greatly simplify most *temporary* grounding problems, because they will grip a conductor from any angle. Thus their versatility reduces station grounding equipment to a minimum. VERSI-TAPS accommodate a large range of conductor sizes, and their parallel serrated jaws assure a positive high pressure connection.

VERSI-TAPS are supplied with MEMCO attached safety operating sticks, or they may be "handled" with MEMCO SAFETY HEAD "hot sticks." However, they can be operated by other makes of "bell socket" operating sticks.

For *quick, safe* grounding, specify:

MEMCO VERSI-TAPS WITH MEMCO SAFETY HEAD STICKS

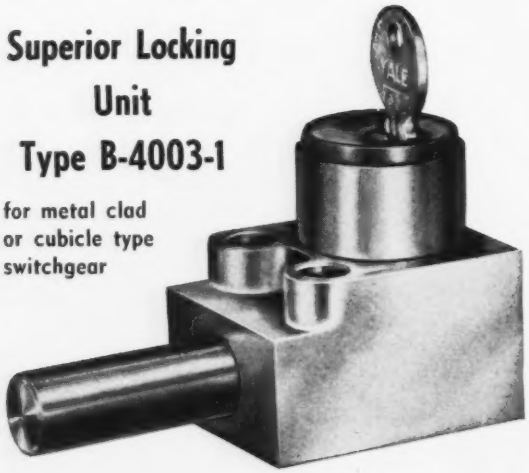
Write for Bulletin 405-A

MEMCO ENGINEERING & MANUFACTURING CO., Inc.
COMMACK, L. I., N. Y.

★ SUPERIOR ★
LOCKING UNITS

Superior Locking Unit Type B-4003-1

for metal clad or cubicle type switchgear



COMPACT and ADAPTABLE

Compactness of design is a feature of these Superior Locking Units that permits their use in areas where space is restricted. They are arranged to fit Interlock mounts which have been standardized by most manufacturers.

They are adaptable for operation with blocking segments, positioning rods, plates or other kinds of auxiliary mechanisms to form an effective Interlock.

Superior Locking Units are designed to operate in conjunction with all CORY Interlocking Systems

Write for technical bulletin

THE SUPERIOR APPLIANCE CO.

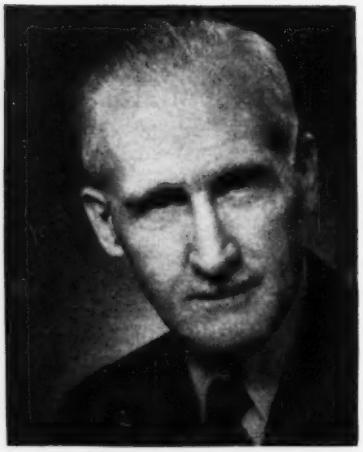
Manufacturers of Safety mechanisms of every description

73-39 Central Avenue • Glendale, Long Island, N. Y.

services group of General Electric. He joined GE in 1934 as president of Southern Appliances, a GE subsidiary.

Potter was elected a vice president of GE in 1947 and assigned to customer relations work. He went to Washington three years later. Before that appointment he was a commercial vice president, having been named to that position in 1945.

The retiring official started his career with GE in 1910 with the Edison Lamp Works at Harrison, N. J. In 1930 Potter went to Nela Park, Cleveland, as general manager of the Works and two years later advanced to the post of general sales manager of the lamp department's eastern division.



LUCIUS E. STEERE, JR

Pepco Designates Steere as Electrical Engineer

Lucius E. Steere, Jr, has been appointed electrical engineer of Potomac Electric Power Co. He succeeds the late W. Jeffries Lank (EW, Nov. 24, p 31).

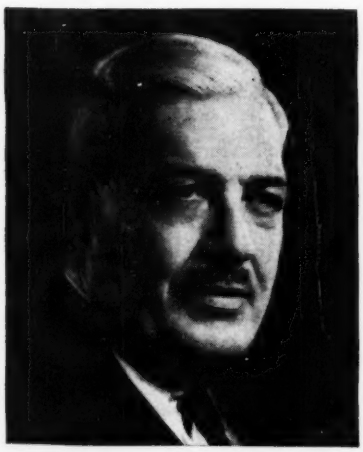
In his new post, Steere will be responsible for the administration of the electrical engineering and system planning activities of the company.

Steere began his employment with Pepco in 1920 as an assistant electrical engineer and since 1941 he has been engineer, inside plant, in the electrical engineering department.

•

Alfred L. Hartridge, who has been personnel manager of Stone & Webster Engineering Corp, Boston, has been elected treasurer. Hartridge, who will continue to have his headquarters at Boston, succeeds **Frank A. Stevens,** who has resigned from the treasurer's

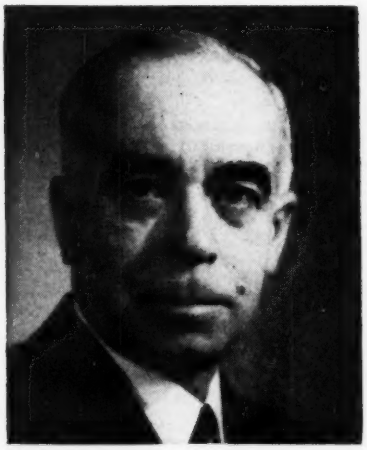
post. Stevens, who has been associated with the corporation's financial affairs for more than 40 years, will continue as a vice president in the New York office. Stone & Webster has also named **John C. Nolan** assistant treasurer and **Fred R. Stevens** personnel manager to succeed Hartridge.



ARTHUR L. PATTERSON

Shawinigan Engineering Appoints Patterson a VP

Arthur L. Patterson, chief engineer of Shawinigan Engineering Co, Ltd, Montreal, has been made vice president of the company. He has been



GUY RINFRET

succeeded as chief engineer by Guy Rinfret, supervising engineer.

Both men have been with the company since it was organized in 1919 as a subsidiary of Shawinigan Water & Power Co.

Patterson was appointed chief engineer two years ago and Rinfret supervising engineer six years ago.

- Conductor doesn't have to be centered for accuracy, (toroidal wound transformer)
- Pocket-size, belt-mounting
- Covers 9 ranges
- Probe jaws completely insulated
- Test lead plug insulates itself when removed from meter
- No-rim window floods scale with light

only
AMPROBE
has these features!

AMPROBE "600"
0-15/30/60/150/300/600 amps A-C
0-150/300/600 volts A-C
$59.50 complete with cowhide case and voltage test leads.

AMPROBE "1200"
to 1200 amps A-C
$67.50 complete

AMPROBE "300"
to 300 amps A-C
$49.50 complete.

Measures current instantly without interrupting service

PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y.
(Export Div.: 458 Broadway, N.Y.C.)

AMPROBE®

the only pocket-size snap-around volt-ammeter

WRITE TODAY:

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Send Bulletins describing

☐ Amprobe Models 600 & 1200

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Seal it fast ...seal it to last with

Johns-Manville

DUXSEAL

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for sealing duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package for smooth, workmanlike jobs. Every electrician should keep a package in his tool box for on-the-spot use.

Stays plastic—Duxseal stays plastic indefinitely. Will not slump, melt or run under ordinary temperatures.

Stays tight—Clings to duct walls and cables but flexes with expansion and contraction of the cable.

Stays insoluble—Unaffected by ground waters and gases.

Stays harmless—Will not injure workmen's hands or react with rubber, metals or painted surfaces.

Tight seals for other electrical uses:

J-M Tranolseal . . . for use against refined oils employed in transformers, switches and similar equipment.

J-M Uniseal . . . for caulking equipment outdoors or in fume laden areas. Resists temperatures up to 180° F.

If you would like to know more about Duxseal and other J-M labor-saving sealing compounds, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, write 199 Bay Street, Toronto, Canada.

JM

Johns-Manville
SEALING COMPOUNDS

JACKSON KEMPER

H. K. Porter Co Elects Kemper Vice President

Jackson Kemper has been elected vice president of H. K. Porter Co, Inc, Pittsburgh. Kemper will continue in his present capacity as general manager of Porter's Watson-Stillman Fittings Division, at Roselle, N. J. All operating and sales activities of the division are under his supervision.

Kemper has been with Porter since it purchased the Watson-Stillman Co last September. Prior to his association with Watson-Stillman, he filled various engineering and sales positions with Yarnall-Waring Co, American Chain & Cable Co, and Birdsboro Steel Foundry & Machine Co.

•

Don T. McKone, who has served as legal counsel for Consumers Power Co for many years, has been elected a member of the board of directors of the utility. McKone is senior partner of McKone, Badgley, Kendall, & Domke, a Jackson, Mich., law firm.

A. D. Hammond and **J. W. Frazier** have been elected to the board of directors of Graybar Electric Co. Hammond, Atlanta district manager, started with Graybar in 1906 and Frazier, Kansas City district manager, joined the firm in 1909.

Eric Hartert, director of Line Material Co's International Division, has been appointed president and a director of the newly formed McGraw Electric Pan American Corp, an Elgin, Ill., corporation which will buy electrical products made by Line Material and other McGraw Electric Co divisions and sell them to Western Hemisphere

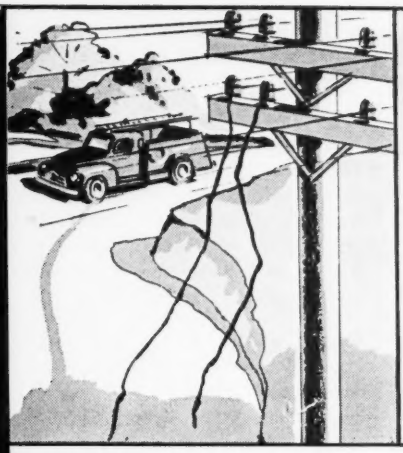
WESTERN LARCH has many fine qualities that make it ideal for telephone and transmission pole use... high bending strength; high compressive strength; high shock resistance; unusual hardness; durability; long life and low service cost.

Western Larch is grown by J. Neils on virgin forest lands; produced and treated in the company's modern pole plant.

J. Neils Lumber Company, manufacturer of quality forest products since 1895, invites your inquiry on treated Western Larch poles. An illustrated folder about us, our pole facilities, and how we can serve your requirements, will be furnished on request.

POLE DIVISION
J. Neils
Lumber Company
J N
Libby, Montana

6 ways to cut your costs WITH Motorola 2-Way Radio



1 **Cut outage time**—immediate dispatching of line crews speeds repair work, averts *anticipated* trouble. Motorola radio brings 2-way contact with your crews *anywhere!* Instantly!

2 **Reduce "dead" mileage**—with Motorola radio you contact the *nearest* crew, send them over the *shortest* route. Motorola takes shocks of rough roads, operates in all weather.

3 **Save wasted man-hours**—your crews report immediately when a job is done; there's no searching for communication in remote areas. Motorola is a *rough-and-ready* tool for your line crews.

4 **Speed trouble shooting**—Handie-Talkie® portables help co-ordinate work, isolate trouble quicker. When storms threaten, crews stay on the job—ready for trouble *before* it happens!

5 **Get reports sooner**—join your network with local police, fire and public service radio for immediate reports of fires, accidents and other possible causes of power failure. Motorola serves them all.

6 **Cut vehicle maintenance costs**—Motorola radio dispatching means less mileage, less gas, oil and depreciation. Motorola *pays for itself* in savings in a relatively few months.

Choice of more and more Utilities Companies

Motorola 2-Way Radio

pays for itself many times over

With these cost-cutting advantages you can improve customer service, make greater profits. Motorola offers you *complete* communication service . . . outstanding performance . . . rugged dependability. Write today—your local Motorola engineer will show you how Motorola can cut your costs.

Motorola®

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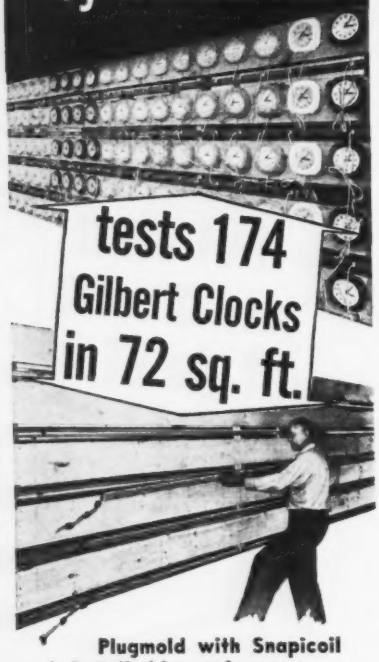
PLUGMOLD 2000 with SNAPICOIL by WIREMOLD



Plugmold with Snapicoil is installed in one long run . . . No multiple connections between short lengths.

The Gilbert Clock Company of Winsted, Connecticut, found that, with Plugmold 2000, they could have duplex outlets on close centers . . . thus making it possible to utilize the available space on the clock-testing racks to best advantage, since TWO clocks can be serviced by only ONE duplex outlet. Plugmold with Snapicoil is *the modern way* for easier, faster, and cheaper installation of multiple outlets.

Write today for the new, free Plugmold 2000 book!

PLUGMOLD 2000

WIREMOLD'S *New* multi-outlet system

THE WIREMOLD COMPANY
Hartford 10, Connecticut

nations. In addition to his new duties, Hartert will continue to direct L-M's export trade at Milwaukee as he has for 25 years.

Paul E. Morgan and **Raymond C. Baker** have been admitted to partnership in Stephen Fitzgerald & Co, public relations counsel for the National Association of Electric Companies. Morgan joined the New York firm in 1948 and Baker in 1949.

Paul S. Colby, who joined Carolina Power & Light Co as an engineering consultant last October, has been named manager of the substation and valuation section of the operating and engineering department of the utility. He succeeds the late A. M. McCabe (EW, Jan. 12, p 135). Colby was associated with Ebasco Services, Inc, before going to Carolina P&L.

G. J. Doss has been appointed general manager of Electric Products Co's newly established E. P. Switchboard and Control Division, which now handles expanded operations of engineering and manufacturing of all switchboard and control functions. Doss came to Electric Products in 1946 as manager of the Cleveland district office and in 1951 was advanced to assistant sales manager.

OBITUARY

William W. Sherwood, 49, executive engineer in the electronics section of the engineering department of Sangamo Electric Co, died Jan. 7. He had been employed by Sangamo since 1936 and for the past 12 years directed the company's design and development work in the field of submarine detection.

Murray G. Tanner, 52, secretary of the New York Public Service Commission, died Jan. 12 at Albany. Tanner, a former newspaper man, was named to secretary's post in 1940 after having served for ten years as assistant secretary and executive secretary in the New York City office of the commission.

Earl D. Chapman, 65, retired manager of Ohio Power Co's Western Division, died Jan. 5 at Tiffin, Ohio. Chapman, who started his utility career in 1907, was named manager of the division in 1950, a post he held until he retired last March.

EASIER TO INSTALL

PLUGMOLD 2000 with SNAPICOIL by WIREMOLD

CUTTING and FITTING reduced to a minimum

No "pre-engineering" when you install Plugmold 2000 multiple convenience outlets . . . every step you take gets the job done! . . . Plenty of knockouts for feeding and mounting in Plugmold 2000 base—no drilling! . . . You can feed in at any convenient point—no special fittings required! . . . Elbow fitting covers snap on and *overlap*—no precision cutting required!

Write today for new, free Plugmold 2000 book!

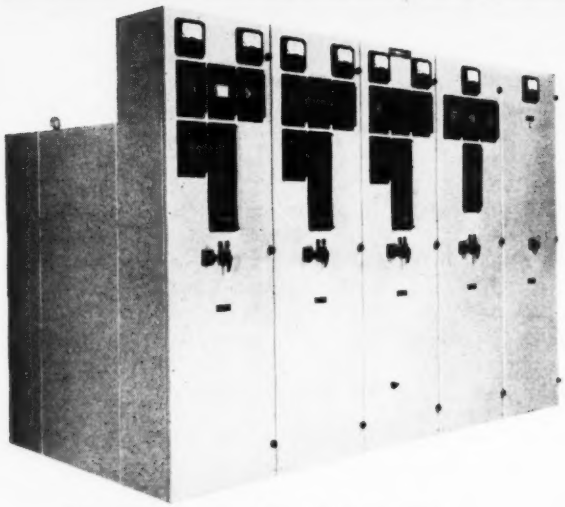
PLUGMOLD 2000

WIREMOLD'S *New* multi-outlet system

THE WIREMOLD COMPANY
Hartford 10, Connecticut

THE MODERN

STANDARDIZED, VERTICAL LIFT, METAL-CLAD OIL CIRCUIT BREAKER SWITCHGEAR

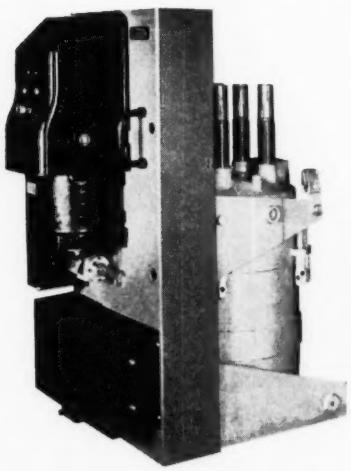


2300, 4160, 4800, 7200 & 13,800 VOLTS
50 TO 500 MVA INTERRUPTING CAPACITY
600 — 1200 AMPERES CONTINUOUS
INDOOR OR OUTDOOR CONSTRUCTION

Photo shows assembly of three motor starting, one incoming line and one auxiliary feeder cubicles. Oil circuit breakers are 5 KV, 600 Amp, 3 Phase, 100 MVA interrupting capacity.

THE MODERN SWITCHGEAR —

— permits quick, easy inspection of oil circuit breaker contacts and mechanism. Just remove tank nuts and elevate breaker out of tank.



THE MODERN SWITCHGEAR—

— has oil circuit breaker mounted on truck which eliminates transfer dollies and test stand — utilizes maximum benefits of drawout construction. Closing relays, rectifiers and related apparatus are all mounted on withdrawable truck.

STANDARD BASIC UNITS

1. Swinging instrument panel
2. Generator
3. Exciter for generator
4. Totalizing
5. Incoming supply
6. Feeder
7. Induction motor — full voltage starting
8. Induction motor — reduced voltage starting
9. Synchronous motor—full voltage starting
10. Snychronous motor—reduced voltage starting
11. Bus sectionalizing
12. Blank unit
13. Auxiliary compartment — miscellaneous equipment
14. Bus entrance compartment
15. Air or oil isolator

Write for additional information

NELSON Electric MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE. TELEPHONE 2-5131

Harvey's Aluminum Project . . .

. . . scheduled to be started immediately. Located at The Dalles, Ore., the $35-million plant's first output is set for mid-1954

Harvey Machine Co, Inc., of Torrance, Calif., plans to begin work immediately on a $35-million primary alumina reduction plant at The Dalles, Ore., for which a certificate of necessity was issued Dec. 24 by Defense Production Administration. First production is scheduled to hit the market in mid-1954.

Harvey's certificate is for a total of $65,250,000, with 85% allowed for accelerated tax amortization. Besides the reduction plant, $10 million is allowed for development of bauxite supplies, and $20,250,000 for construction of an alumina plant, which will be built within three years. Harvey is waiting now for a certificate of necessity before completing plans and deciding on a location for a sheet rolling mill.

Capacity Set at 54,000 Tons . . . The new plant's annual capacity of 54,000 tons brings to 164,000 the new aluminum production under DPA's third round of expansion in the industry. In November DPA issued two certificates of necessity to Olin Industries, Inc, of East Alton, Ill., for facilities to produce annually 110,000 short tons of primary aluminum, together with fabricating facilities.

When Harvey looked around for power supplies, its dealings for power ran head on into the Northwest's current shortage and criticism of surcharges on private utility customers for high cost steam generating which the government ordered the pool to start producing in early fall months of 1952. As a result, a completed power contract calls for Harvey to pay the pro rata cost of steam generation at the average rate incurred by private utilities any time it becomes necessary to use steam stand-by plants to maintain firm power loads. The unique feature covers the water years 1954–55 to 1956–57. No other aluminum industry in the region is under similar restriction.

Power supplies for the new Harvey plant will come from the Bonneville Power Administration. The announced agreement is for:

1. 40,000 kw of firm power to be available commencing July 1, 1954.

2. 20,000 kw to be available as "junior" firm power, which is defined as power which will not be cut off until all interruptible power has been cut off. If cuts in firm power must be imposed, "junior" firm power will be the first to be disconnected.

3. 60,000 kw of interruptible power.

It was revealed in Portland that this will be supplied from firm power reservations of 120,000 kw set aside by BPA for critical defense plants at the request of DPA.

Power initially will come from McNary Dam, which will be completed in 1954 and tied into the BPA system. By 1957 The Dalles Dam powerhouse will be operating and Harvey will then draw energy from the nearby plant and take advantage of on-site power rates.

Investigates Bauxite Sources . . . Harvey is investigating bauxite supplies chiefly in the Guianas and on Bintan Island, near Singapore. The company is currently engaged in court action over a bauxite mine in British Guiana owned by the Berbice Co, a subsidiary of American Cyanamid Co. The action will determine whether Harvey or Reynolds Metals Co will get the mine, Harvey claiming to have a sale agreement preceding one between Berbice and Reynolds. Harvey intends to use the mine for its principal source of bauxite.

Harvey also hopes to develop a domestic source of alumina through purchase of a government owned plant in Salem, Ore., one of four built in this country during the war to research manufacture of alumina from domestic bauxite clays. The Salem plant will be used as a research and pilot plant for the treatment of Columbia Basin ores and manufacture of other chemicals used in the aluminum industry. Clays in the Columbia River

Manufactures 10 Millionth Breaker

Federal Electric Products Co recently celebrated the manufacture of the 10 millionth Stab-lok Circuit Breaker at its Newark, N. J., plant. L. W. Cole (left), chairman of the board, is shown presenting the 10 millionth unit to T. M. Cole, his son, president of Federal. The presentation was witnessed by H. J. Vorzimer (right), executive vice president, and members of the Federal organization and of the press.

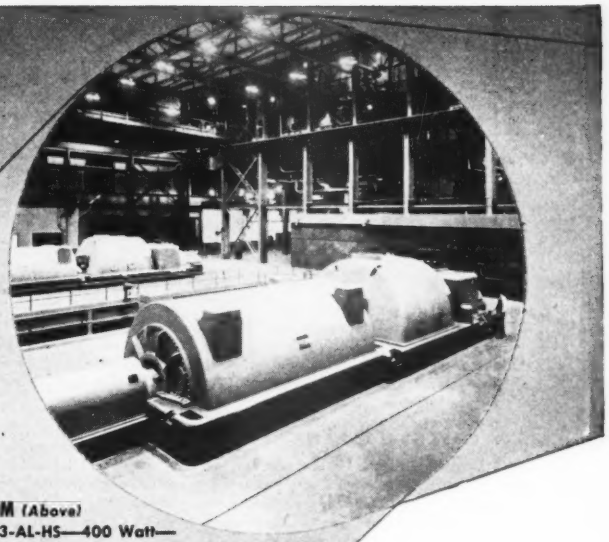
The Stab-lok Circuit Breaker, which does not require spare accessories, is used in place of fuses. It is capable of interrupting 5,000 amps and operating at least 10,000 times.

HOLOPHANE

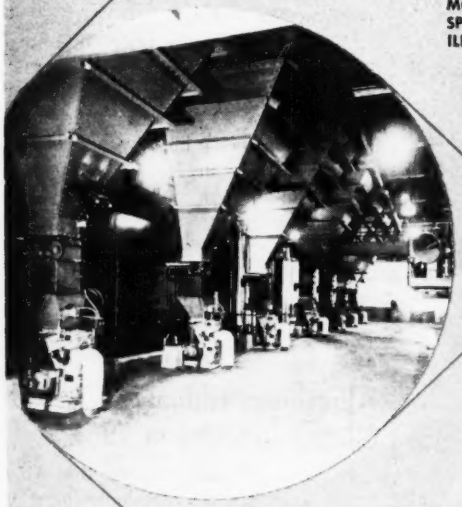
Modern Lighting in a Modern Plant . . .

•

TITUS STATION,
Metropolitan Edison Co.
Reading, Pa.
ENGINEERS: GILBERT ASSOCIATES, INC.



TURBINE ROOM *(Above)*
HIBAY NO. 693-AL-HS—400 Watt—
E-H1 Mercury Lamp
HIBAY NO. 690-AL-HS—750 Watt—
Incandescent Lamp
installed as twin units.
MOUNTING HEIGHT: 40 feet
SPACING: 17′ x 28′ on centers
ILLUMINATION: 30 footcandles in service

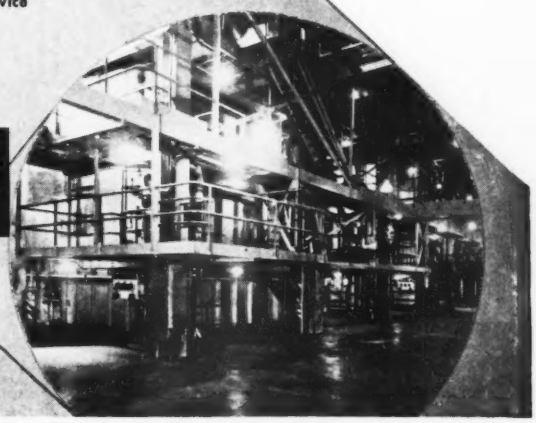


• FOR TROUBLE-FREE ILLUMINATION, each specific area requires individual treatment to assure proper quality and quantity of lighting. Holophane installations provide economies substantiated by analysis. A variety of HIBAY* and LOBAY* reflectors have been designed for the severe conditions typical of industrial plants.

An ideal combination:
Holophane Reflectors using
Mercury and Incandescent light sources.

** Engineering Services are rendered, and recommendations submitted, without charge, through professional advisers.*

FIRING AISLE *(Left)* **And**
BOILER ROOM *(Below)*
LOBAY NO. 685—500 Watt
NOS. 02470, 02470-BC—150 Watt
ILLUMINATION:
Platforms—10 footcandles in service
Aisles—25 footcandles in service



HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N. Y.
THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

Holophane

How not to "SHORT-CHANGE" Your Customers

. . . WHEN YOU SELL THEM TAPE!

While minimum length can be depended on to be accurate in every roll of tape, it's the *weight* of the roll that you must watch. It is important for you to know: Does the No. 4 Roll actually weigh 4 ounces, as it should; or the No. 8 Roll 8 ounces?

For weight reveals whether tape is full strength in substance, or whether its protective and adhesive properties have been weakened due to skimpy materials. Underweight tape results in customer dissatisfaction.

You can always weigh every roll you buy, of course, but why bother, when HAARTZ-MASON publicly makes you a DUAL GUARANTEE — a guarantee covering both weight and length, and prints this information boldly on every roll and container.

HAARTZ-MASON is currently promoting the importance of weight to your tape customers and urging them to look for weight information on every roll they buy. So avoid possible loss of tape sales by putting in a stock of the DUAL GUARANTEED HAARTZ-MASON brands today.

Haartz-Mason, Inc.

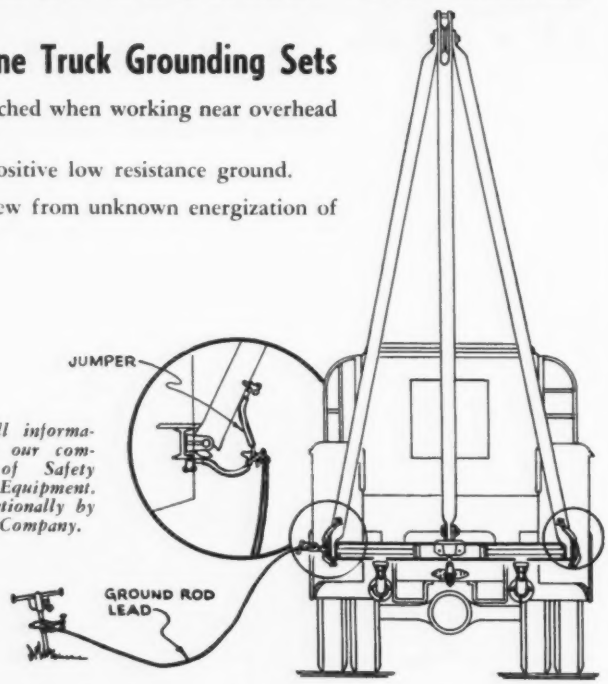
WATERTOWN 72, MASS.

Note: Weight and length information are printed boldly on every roll and container.

GROUNDED DERRICKS ARE SAFER

DIECK Line Truck Grounding Sets

1. Easily attached when working near overhead lines, etc.
2. Provide positive low resistance ground.
3. Protect crew from unknown energization of truck.



Write for full information covering our complete line of Safety Grounding Equipment. Distributed nationally by Line Material Company.

DIECK TOOLS

BODENDIECK TOOL COMPANY

325 EAST MAIN STREET —•— TAYLORVILLE, ILLINOIS

Basin have an alumina yield of only about 30% compared with the 50% minimum yield from bauxite ores, but Harvey believes that improved processing will make alumina from the clays economically feasible.

High Bidder . . . Harvey's was the high bid for the Salem plant, but General Service Administration has not yet announced its acceptance. The plant has not been used for alumina research since the war.

Leo Harvey, president of Harvey Machine, says that he expects to get bauxite from abroad for an indefinite time, but that he believes it is important to develop American sources for possible wartime use.

To transport bauxite supplies from Guiana, Harvey is investigating the use of barges, possibly company owned. Barges could be towed up the Columbia River and unloaded directly at The Dalles.

Harvey expects to offer 75% of The Dalles production to the general public at prevailing market prices. Harvey has a 5% interest in the aluminum plant being built by Anaconda Aluminum Co in Kalispell, Mont., and an option on one third of the plant's production.

Beyond saying that it will be entirely private, Harvey has not disclosed financing plans for its aluminum projects.

Aluminum Industry Sets Output Record in 1952

In spite of curtailments due to power shortages, the aluminum industry has set a new production record in 1952, the Aluminum Association has reported.

Based on figures for the first 11 months, total production of primary aluminum in the United States during 1952 is estimated at 1,860,000,000 lb. This represents a gain of about 11% over the 1951 total of 1,673,758,854 lb. It also exceeds the 1,840,358,500 lb produced in 1943, peak year of World War II.

High Appliance Sales Are Predicted for '53

Liberal buying of appliances for replacement purposes throughout the first quarter of 1953 has been predicted by Bret C. Neece, president of

somewhere in your building,
lurking like a cat....
fire is ready to pounce.
In flammable liquids,
electrical equipment, record
vaults. Your surest protection
is a Kidde Fully Automatic
CO_2 Fire Extinguishing System.

Kidde

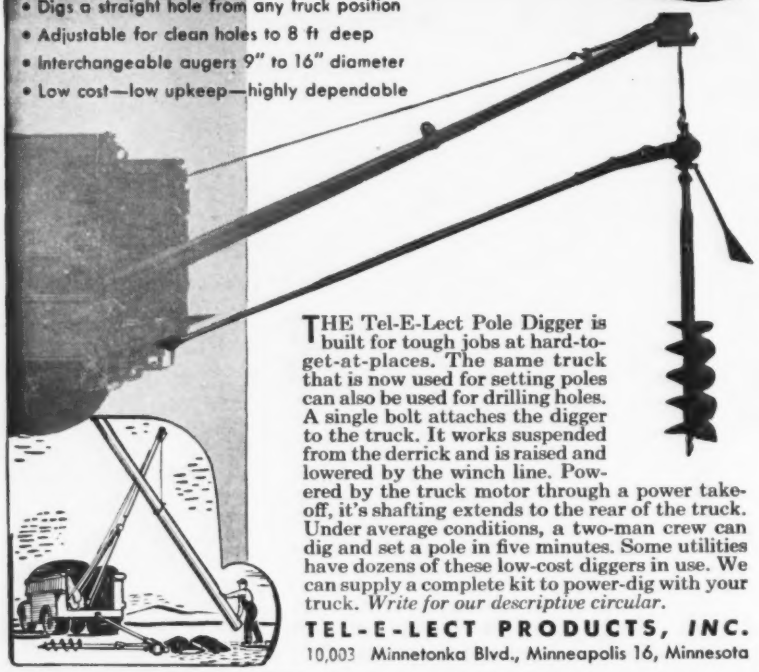
Walter Kidde & Company, Inc.,
1:30 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

...quick as a mouse, check the "Yellow Pages" for your KIDDE dealer

DIG HOLES WITH YOUR LINE TRUCK AND CREW

TEL-E-LECT POLE HOLE DIGGER

- Digs a straight hole from any truck position
- Adjustable for clean holes to 8 ft deep
- Interchangeable augers 9" to 16" diameter
- Low cost—low upkeep—highly dependable



THE Tel-E-Lect Pole Digger is built for tough jobs at hard-to-get-at-places. The same truck that is now used for setting poles can also be used for drilling holes. A single bolt attaches the digger to the truck. It works suspended from the derrick and is raised and lowered by the winch line. Powered by the truck motor through a power take-off, it's shafting extends to the rear of the truck. Under average conditions, a two-man crew can dig and set a pole in five minutes. Some utilities have dozens of these low-cost diggers in use. We can supply a complete kit to power-dig with your truck. *Write for our descriptive circular.*

TEL-E-LECT PRODUCTS, INC.
10,003 Minnetonka Blvd., Minneapolis 16, Minnesota

The 7-Range Clip-On Volt-Ammeter

FERRANTI

Offers These Important Advantages

- Measures up to 1000 amps—up to 600 volts.
- Convenient ONE HAND operation —trigger action.
- Thumb operated range selector switch.
- 7 ranges—5 current and 2 voltage.
- Insulated core—shockproof construction.
- Takes cables up to 2¼" diameter.
- Distinct calibrations—easy to read.
- Suitable for 50-70 cycles.

RANGES: 0-10 *amps;* 0-25 *amps;* 0-100 *amps;* 0-250 *amps;* 0-1000 *amps;* 0-150 *volts;* 0-600 *volts.*

FERRANTI ELECTRIC, INC.
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
FERRANTI, LTD., Hollinwood, England — FERRANTI ELECTRIC, LTD., Toronto, Canada

Landers, Frary & Clark, producers of Universal appliances. Neece's prediction was included in the company's year-end report. Sales of vacuum cleaners, electric and general housewares during 1953 will be at a high level, he said.

Neece also revealed that in one year the company has made up the volume it lost when it sold its major appliance lines. He said 1952 sales roughly equal 1951.

Universal's sales program to increase gross sales by 30% in 1953 will be backed up by technological expansion, Neece stated.

MANUFACTURING BRIEFS

Plans for a $3 million plant expansion program in 1953 have been announced by Motorola, Inc. The program includes the construction and outfitting of a major new plant at Franklin Park, Ill., which will nearly double the firm's television production capacity. The new unit, which will have 278,000 sq ft of usable factory space, is scheduled for completion by mid-1953.

Pacific Electric Manufacturing Corp, San Francisco, has transferred its sales offices from Gary, Ind., to 122 South Michigan Ave., Chicago. The Gary factory and service engineering facilities will be continued at 4500 Harrison St., Gary, Ind.

McGraw Electric Co's Bersted Manufacturing Division expects to put in operation this month its new Moberly (Mo.), factory. The new plant will turn out electric fans until June when food mixers and other appliances will be turned out.

Phelps Dodge Copper Products Corp has started construction of a new building at its Habirshaw Division's plant at Yonkers, N. Y. The new quarters, which will house research and testing laboratories, will enable the company to test and manufacture electrical cables never produced in the U. S.

SALES ASSIGNMENTS

COMPANY STAFFS

Reliance Electric & Engineering Co, Cleveland, has transferred William C. McConnell, sales engineer operating out of the firm's Detroit office, to its Cleveland office. Robert B. Reed, Reliance sales engineer in Birmingham, for the past three years, moves to Detroit to take over McConnell's former sales engineering duties. Rex T. Willard, of Reliance's

HOW STRONG
should a Bus Conductor be?

CHASE square copper tube buses have high mechanical strength to withstand the forces caused by heavy short circuit currents. They have relatively large cross-sectional areas to give maximum structural strength. This permits longer spans between supports without unduly large sags.

Easily assembled and erected . . . with high thermal conductivity and low resistance voltage drop and power loss per pound of metal . . . these bus conductors are well worth your consideration. Write Dept. EW 153 for the Chase Bus Conductor Brochure.

Chase® BRASS & COPPER

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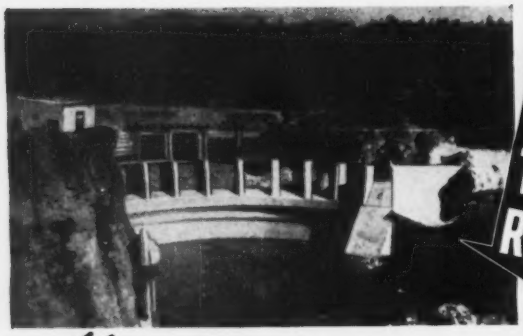
• *The Nation's Headquarters for Brass & Copper*

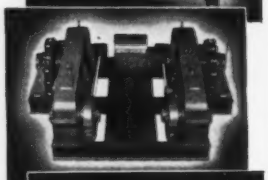
Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	(†sales office only)
Chicago	Houston†	Newark	Rochester†	
Cincinnati	Indianapolis	New Orleans	St. Louis	

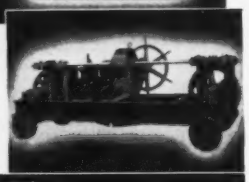


DESIGNED AND BUILT TO MEET ALL REQUIREMENTS

Murray GATES & GATE HOISTS! *for any Size Power Dam*

Cabinet Gorge Dam on Clark Fork River, Idaho





MURRAY GATE HOISTS are designed and built in a wide range of capacities from less than one ton to over one hundred tons . . . from the smallest hand operated to the largest motor operated gate hoist.

In over 50 years of designing and building gate hoists, we have developed designs for many gate hoist problems. We may have designs and patterns to fit your special requirements. In planning gates or gate hoists, we suggest you write us before your over-all plans are complete . . . it may save time and money. We also build gate hoists to fit your plans and specifications.

Write for complete information and Engineering Department recommendations.

MURCO

D. J. MURRAY MANUFACTURING CO. *WAUSAU, WIS.*

When you compare the ease and simplicity of installation and the great holding power of Kearney P-L Anchors with other more costly and more complicated anchors, you will know why Kearney P-L's are gaining such enthusiastic industry-wide acceptance.

KEARNEY P-L All-Steel Expanding-Type Earth Anchors Give You the Best Answer to Any Guying Problem

They're Easy to Install—Have Great Holding Power

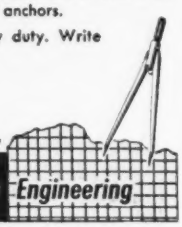
A few blows of the spreading tool and the blades are fully expanded. The opening force is exerted directly onto the blades. There are no arms, joints, pinned hinges or extra parts to jam, shear or break.

P-L Anchors do a better job and can be installed easily in all types of soil. They show additional merit in soil where rocks or other obstructions cause difficulties with other types of anchors.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

Available in 2-blade, 4-blade and 4-blade heavy duty. Write for complete specifications including prices.

JAMES R. KEARNEY CORPORATION
4236 Clayton Ave., St. Louis 10, Mo.
Canadian Plant. Guelph, Ontario



KEARNEY Gives a Little More for a Little Less Through Engineering

Atlanta, sales office, replaces Reed in the Birmingham area.

REPRESENTATIVES

T. J. Cope, Inc, Philadelphia, has appointed the following representatives: Marshall Equipment Co, Montreal, to cover Canada; I. E. Cope & Co, Dallas, Houston, and Amarillo, to cover Texas; and Klass Co, Minneapolis, to cover the North Central area.

Buchanan Electrical Products Corp, Hillside, N. J. has named the following representatives: Wiring Engineering Sales, 1218 Sixth Ave. S, Seattle, will cover Washington, Oregon, Idaho, western Montana, British Columbia, and Alaska. John R. Hauthaway, 23 Glendale Rd., Quincy, Mass., will represent Buchanan in the New England States and the five easternmost provinces of Canada.

MEETINGS CALENDAR

National Rural Electric Cooperative Association
11th Annual Meeting, Civic Auditorium, San Francisco, Jan. 26-29.

***Canadian Electrical Association**
Eastern Zone: Annual Convention, Manoir Richelieu, Murray Bay, Que., June 25-27; General Division, Mont Tremblant Lodge, Mont Tremblant, Que., Jan. 29-30; Following Western Zone Division Meetings will be held at Palliser Hotel, Calgary, Alta.; Engineering, Feb. 23-25; General Division, Feb. 25-26; Sales Division, Feb. 26-27.

Public Utilities Advertising Association
Region 9, Ahwahnee Lodge, Yosemite National Park, Yosemite, Calif., Jan. 29-30; Region 8, Mayo Hotel, Tulsa, Okla., Feb. 2-3; Region 1, Parker House Hotel, Boston, Mar. 4-5; Region 5, Jefferson Hotel, Richmond, Va., Mar. 12-13; National Convention, Chase Hotel, St. Louis, May 7-8.

***Edison Electric Institute**
Prime Movers Committee, Mayflower Hotel, Akron, Ohio, Feb. 2-3; Transmission-Distribution Committee, Shoreham Hotel, Washington, D. C., Feb. 12-13; Electrical Equipment Committee, Jefferson Hotel, St. Louis, Mo., Feb. 16-17; 19th Annual Sales Conference, Edgewater Beach Hotel, Chicago, Mar. 30-April 2; 21st Annual Convention, Atlantic City, N. J., June 1-3.

***National Association of Corrosion Engineers**
Short Course in Corrosion in cooperation with University of California, Berkeley, Feb. 2-6; 1953 Conference-Exhibition, Chicago, March 16-20.

Missouri Valley Electric Association
Industrial-Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 5-6; Engineering Conference, President Hotel, Kansas City, Mo., April 8-10.

Pennsylvania Electric Association
Joint Meeting of Electrical Equipment-Relay Committees, Roosevelt Hotel, Pittsburgh, Feb. 5-6; Winter Meeting, Transmission - Distribution Committee, William Penn Hotel, Pittsburgh, Feb. 12-13; Systems Operation Committee, Hotel Brunswick, Lancaster, Pa., Feb. 19-20; Winter Meeting, Prime Movers Committee, Benjamin Franklin Hotel, Philadelphia, Feb. 26-27; Meter Committee, Hagerstown, Md., April 23-24; Spring Meeting, Transmission-Distribution Committee, Skytop, Pa., May 14-15.

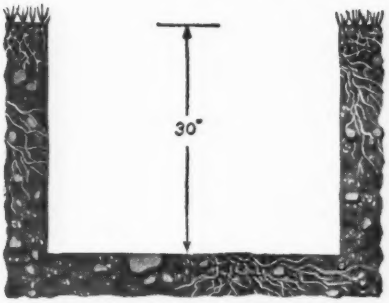
National Adequate Wiring Conference
La Salle Hotel, Chicago, Feb. 26-27.

Southern Safety Conference-Exposition
Hotel Atlanta Biltmore, Atlanta, Ga., March 1-3.

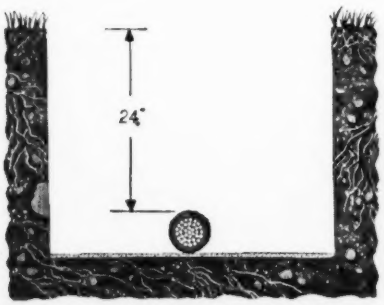
Pacific Coast Electrical Association
Engineering-Operating Section Conference, Long Beach, Calif., March 5-6; Administrative Services Section Conference, Phoenix, Ariz., April 8-9; Annual Convention, Hoberg's, Lake County, Calif., May 13-15.

How to install buried cables in trenches

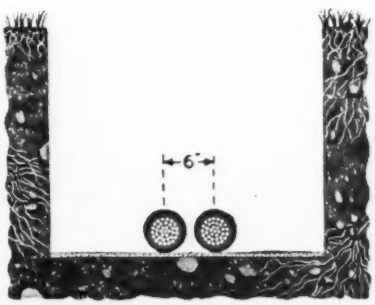
The most generally satisfactory way of installing buried cables is to lay them in a trench on a cushion of sand. There is less bending, distortion or tension than when a cable plow is used, a valuable factor if strains later occur through earth settling. The cable can also be protected by a treated plank or slab of concrete laid over it. Trenching permits the installation of cables at generally greater depths than does plowing. This greater depth makes cables less subject to damage by insects or rodents.



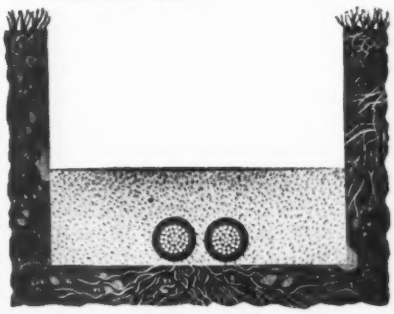
1. The trench should be deep enough (about 30") so that the cable, after providing the cushion mentioned below, will be at least 24" below the surface. This reduces the possibility of mechanical damage.



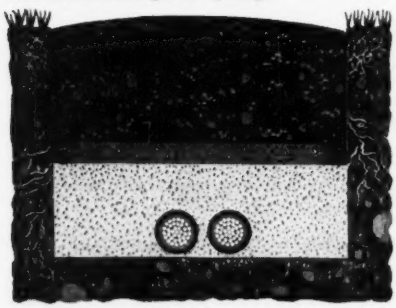
2. Put a cushion of sand on the bottom of the trench, or at least make sure the bottom is free of stones and other harmful debris. Lay cable with a slight snaking, to allow for earth settling and for expansion and contraction during load cycling.



3. When two or more cables are installed in the same trench, they should be spaced uniformly about 6" between centers so that the sand or earth can fill in around them. There must be no criss-crossing.



4. Cover the cable or cables to a depth of about 6" with sand or soft earth free from stones so that no rough edges will press against them.



5. Lay a concrete slab or creosote-treated plank on the sand or soft earth refill, to protect the cable and warn workmen of its presence. Complete the refill. Under highways, streets and rights-of-way, cables should always be installed in conduit.

Because of today's scarcity of rubber and copper, great care should be taken to see that your installations last as long as possible. With a few simple precautions, you can extend the life of your cables under normal operation. Although these precautions are well-known to many, we repeat them in the interest of getting maximum efficiency and long life out of our material and resources.

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department

ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

SAFEST TO RECOMMEND FOR EVERY COMPLETE OR AUXILIARY HEATING NEED

ELECTROMODE ALL-ELECTRIC HEATERS

Check These ELECTROMODE Advantages

HOME MODEL WA

Handsomely styled Wall-type and Portable models, capacities from 1320 to 4000 watts, for homes, offices, motels, lobbies, churches, institutions. *Wall-type Down Flo illustrated.*

INDUSTRY MODEL 14-10

Scientifically engineered Unit Heaters in Portable and Suspension-type models, capacities 1.5 to 45 K.W., for factories, isolated locations, hard-to-heat areas. *Suspension-type illustrated.*

FARM MODEL FA-15

Especially designed for the Milk House, capacities 1500 and 3000 watts. Prevents water pipes freezing, keeps area dry, aids ventilation. Also used for brooder pens and vegetable bins.

- **QUICK, EASY TO INSTALL** — No ducts, pipes, radiators
- **MINIMUM MAINTENANCE** — No fuel to order or store
- **AUTOMATIC CONTROLS** — Uniform temperatures
- **100% EFFICIENT** — Immediate, fan-circulated heat
- **CLEAN, ODORLESS, HEALTHFUL** — No smudge on walls or decorations
- **MODERN DESIGNS**
- **SATISFIED USERS**
- **COMPLETELY SAFE** — Only Electromode has the cast-aluminum, completely enclosed heating element. No danger of fire, shock or burn. Automatic safety switch prevents overheating.

Approved by Underwriters' Laboratories

Send for FREE LITERATURE . . . full of specifications, illustrations, installations, diagrams and how to figure electric space heating.

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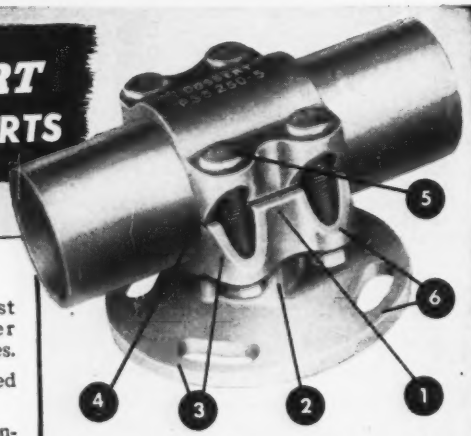
Leader in Electric Heating Since 1929

DOSSERT BUS SUPPORTS



Type PSS

1. Designed to resist severe cantilever and impact stresses.
2. Heavy-duty, ribbed throat underbody.
3. One-piece, rigid construction.
4. Slip-fit and tight-fit by reversing cap.
5. Silicon bronze high-strength bolts... oval neck connector or hex head type.
6. High strength bronze alloy . . . non-magnetic . . . corrosion-resistant.

Write for Catalog 45-1B

Immediate Delivery of all standard items

A rugged Bus Support Clamp which permits rigid or slip-fit clamping on tubular bus conductors. Unique features make this clamp an outstanding support for trouble-free, enduring service.

Also available on specification with an 8-hole slotted base.

DOSSERT MFG. CORP.
249-255 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904

For use with aluminum conductors add HSN to the catalog number.

National Association of Purchasing Agents
Public Utility Buyers Group, Hotel Roosevelt, New Orleans, March 9-10; Annual Meeting, Statler Hotel, Los Angeles, May 24-27.

National Electrical Manufacturers Association
Winter Meeting, Edgewater Beach Hotel, Chicago, March 9-12; Annual Meeting, Nov. 9-12.

***Illuminating Engineering Society**
Canadian Regional Conference, Chateau Laurier, Ottawa, Ont., March 23-24; Southwestern Regional Meeting, Hotel Baker, Dallas, Tex., April 12-14.

A&M College of Texas
Conference for Protective Relay Engineers, Dept. of Electrical Engineering, College Station, Tex., March 23-25.

***Southeastern Electric Exchange**
20th Annual Conference, Boca Raton Hotel, Boca Raton, Fla., March 23-25; Engineering-Operation Section, Edgewater Gulf Hotel, Edgewater Park, Miss., April 16-17; Industrial Power Sales Conference, Fort Sumter Hotel, Charleston, S. C., May 21-22.

Institute of Radio Engineers
National Convention-Exhibit, Waldorf-Astoria Hotel and Grand Central Palace, New York, March 23-26.

Oklahoma Utilities Association Convention
Tulsa Hotel, Tulsa, March 26-27.

***Northwest Electric Light & Power Association**
Engineering-Operation Section, Multnomah Hotel, Portland, Ore., Apr. 8-10; Business Development Section, Davenport Hotel, Spokane, Wash., May 4-6.

***Northwest Public Power Association**
Engineering-Operations Section, Osbourn Hotel, Eugene, Ore., April 16-17; Annual Convention, Ridpath Hotel, Spokane, Wash., May 6-8; Accounting Section, Monticello Hotel, Longview, Wash., Sept. 17-18.

***Maryland Utilities Association**
Annual Business Conference, Lord Baltimore Hotel, Baltimore, April 17; Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 18-19.

***Electric-Gas Utility Accountants**
National Conference, Sherman Hotel, Chicago, April 20-22.

American Institute of Electrical Engineers
Southern District Meeting, Louisville, Ky., April 22-24; Northeastern District Meeting, Copley Plaza Hotel, Boston, April 29-May 1; Summer General Meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 15-19; Pacific General Meeting, Hotel Vancouver, Vancouver, B. C., Sept. 1-4.

***Rocky Mountain Electrical League**
Annual Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 26-28.

***Chicago Electrical Industry Show**
Sponsored by Electric Association and Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, May 11-14.

***Third International Congress On Electro-Thermics**
Paris, France, May 18-23.

***Electrical Manufacturers' Representatives Association of Michigan, Inc.**
1953 Electrical Exhibition, State Fair Grounds, Exhibition Bldg., Detroit, May 20-22.

***National Association of Electrical Distributors**
45th Annual Convention, Conrad Hilton Hotel, Chicago, Week of May 24.

***American Welding Society**
National Spring Technical Meeting, Shamrock Hotel, Houston, Tex., June 16-19.

***American Society for Testing Materials**
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 29-July 3.

***Instrument Society of America**
8th National Instrument Exhibit, Sherman Hotel, Chicago, Sept. 21-25.

* **Addition this week.**

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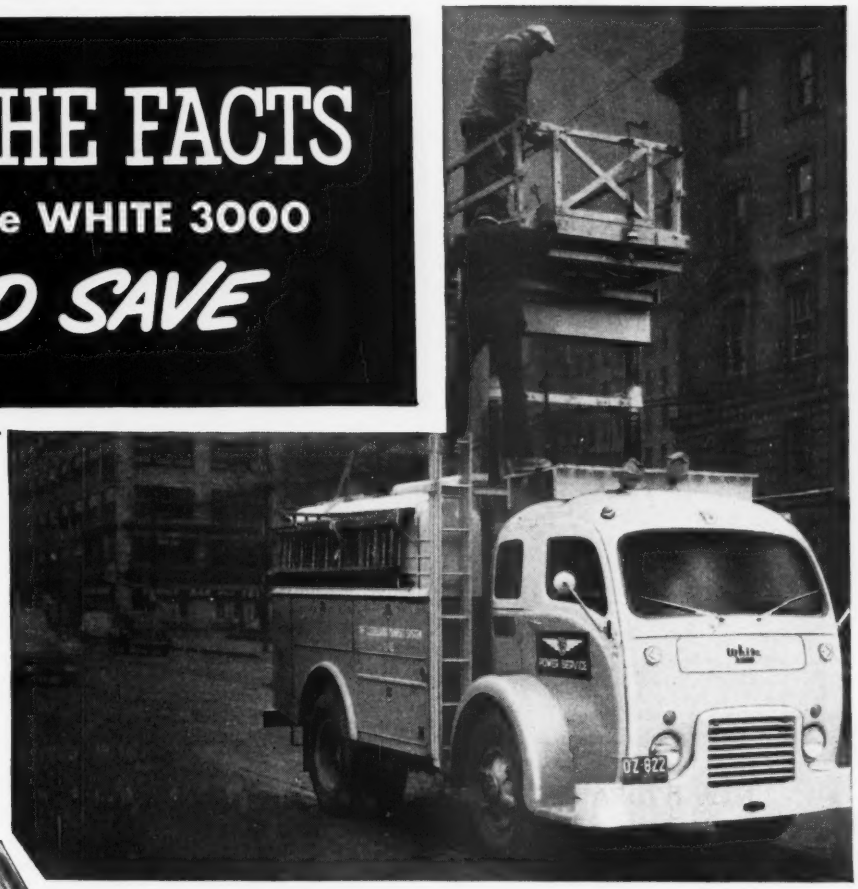

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BOOK REVIEWS

Substation Practice

Sub-station Practice, Second Edition. By T. H. Carr. Published by Chapman and Hall, Ltd, London W. C. 2, England. 467 pages, illustrated. Price 55 shillings.

Comprehensive in its coverage, this book discusses substations of all types from the outdoor transmission switching and step-down station to the enclosed distribution station. Coal mine installations are included, also rectifier and rotary convertor stations for electric traction. Many examples are given of the electrical layout and construction of these stations.

The characteristics and operation of station equipment are well covered. Detailed examples illustrate the methods for selecting equipment, evaluating prices and losses. Overcurrent and overvoltage protection are discussed extensively, with many examples of the circuits and relays required. A chapter on technical calculations illustrates the analysis of fault conditions, power factor improvement, and economic comparisons. Heating, ventilating and fire prevention are included.

The author devotes a chapter to the general considerations which determine the type of substation, its location, and its integration into the system. He closes with a chapter on personnel, operating practices, communication and control.

The book is written primarily in terms of electrical equipment and installations in Great Britain. This second edition reflects experiences under national ownership with a thought toward the greater opportunities which it offers. It should be valuable as a reference to executives, distribution engineers, and electrical students concerned with British installations. American engineers would find certain portions helpful, but many of the examples would not apply as well to their installations.

Code Diagrams

Electrical Code Diagrams, Vol. 1. By B. Z. Segall, Published by McGraw-Hill Book Co, Inc, New York 36, N. Y. 754 pages, illustrated. Price $12.50.

This is the first volume of a two-volume work based on the 1951 Edition of the National Electrical Code. It shows diagrammatically one or more illustrations of each code rule—including over 1300 illustrations. Supplementary information clarifies how each rule may be applied. Both practical and theoretical material is given, including theory of motors and some basic electronics. As a means of keeping up with the code chapters on wiring design and protection and wiring methods and materials, it is designed for those in practical electrical work and school and industrial training classes.

Radio Control

Remote Control by Radio. By A. H. Bruinsma. Distributed by Elsevier Press, Inc, Houston 6, Texas and New York 22. 104 pages, illustrated. Price $1.50.

A recent addition to the Philips (Eindhoven, Holland) Technical Library Popular Series, this book deals with the application of electron tubes to remote control by radio. Two types of systems are discussed: (1) conventional amplitude modulation with two independent continuous channels, (2) a pulse system with eight channels. The development of transmitters and receivers for both systems, operating at 100 mc, is presented in considerable detail.

The receivers utilized miniature tubes for battery operation to control model ships. The methods by which the ship propulsion motors, rudders, and auxiliaries

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It is smart, economical management to control brush along utility rights-of-way by dormant basal bark spraying. This is true for all sections of the country. It is particularly recommended for cotton...tobacco...truck crop regions.

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These benefits are proven not only by intensive research on Thompson experiment stations but by the field experience of many REA Co-ops, electric and telephone companies along hundreds of thousands of miles of line.

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Please write for data sheet on mixing and spraying and for price schedule.

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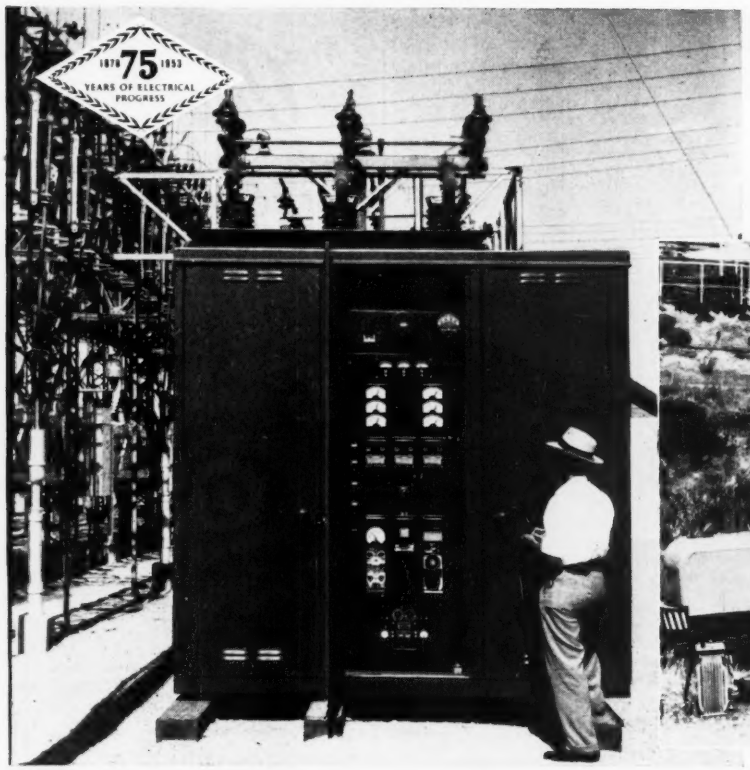

A 1500-kva General Electric single-circuit integral unit substation. The control and metering compartment is being inspected by the worker.

Installing a G-E single-circuit unit substation at a West Coast utility. This substation replaced old power transformers and was in service the same day it arrived.

Here's a flexible, "packaged" answer to your load growth problems...a G-E single-circuit substation

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General Electric completely "packaged" unit substations incorporate transformer, vertical-lift magne-blast air circuit breaker, load-ratio control and control panel with voltage regulating relay and line-drop compensator, switches and other necessary instruments in a single, fully co-ordinated enclosure. They are most widely used in areas of light-load-density, for radial feed. Units are compact and require little installation space. They present an attractive appearance and may be installed in residential areas, near the load center.

High re-use value. If your load problems are temporary or seasonal, or if the load shifts, the G-E unit substation may easily be relocated to meet your requirements. Installation is simple—many jobs are in service within a single day.

Low and predictable installed cost, because there is nothing else to buy . . . nothing to overlook. Purchasing is simplified . . . only one specification, one purchase transaction. Repeat orders can be placed without further engineering or specification writing.

Ratings available. G-E single-circuit unit substations are furnished in ratings from 12 to 66 kv incoming voltage. They have widest application in light-load-density areas where a single 2.5- or 4.33-kv feeder with 1000 to 3000 kva of load is to be served or in the 15-kv class for loads of 1000 to 5000 kva.

If you are faced with load-growth problems, look into G-E single-circuit integral unit substations. For full information get in touch with your General Electric sales representative, or write to Section 422–4, General Electric Company, Schenectady 5, N. Y.

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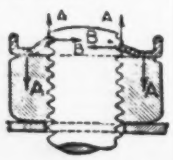
Powerful spring tension (A-A) is exerted upward on the bolt threads and downward on the ordinary nut, while slotted jaws (B-B) close in and grip the bolt like a chuck.



Samples and literature on request

The PALNUT Co.

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were controlled give clues for the control of remote substation and hydro plant equipment.

Written in English, this book is interesting reading to a person with general knowledge of radio and electricity. It should be helpful to many engineers and technical personnel who find applications for remote control in their business pursuits or hobbies. Adequate vacuum tube data in the appendix would assist them to substitute equivalent tubes.

Radiation

The Radiant Universe. **By G. W. Hill. Published by Philosophical Library, 15 E 40th St, N. Y. 489 pages, illustrated. Price $4.75.**

Origin and behavior of the bodies which make up the universe rests here on an hypothesis which postulates a radiation which "permeates all space and all matter and is the reservoir from which all energy is drawn and to which all energy is eventually returned". It is reasoned from this that the equilibrium of the cosmos rests on creation of mass out of radiaiton energy as fast as it is destroyed in the reverse process. The cosmos is thus both dynamic and self-sustaining. The author considers his theory amply confirmed by the negative results of the famous Michelson-Morley experiment.

Some of the phenomena discussed are confined to the solar system and some to the earth itself. Planets are attributed to the fissional activities of the sun. But why have some planets no satellites, why have none of the satellites any satellites of their own and why do all satellites like our moon have rotational period equal to the revolutionary period? How come the rings of Saturn and how come so many binary stars? Of quite direct interest to power engineers is the pronouncement that the earth is steadily getting warmer. Another is that coal and oil deposits are the result of glacial cover-up rather than of swamp subsidence.

Mathematics

Advanced Mathematics in Physics and Engineering. **By Arthur Bronwell. Published by McGraw-Hill Book Co, 330 West 42nd St, New York 36, N. Y., 487 pages, illustrated. Price $6.00.**

This book is designed to provide the comprehensive mathematical background and techniques required for advanced physics and engineering. Professor Bronwell has recognized the general similarity in the mathematics of the varied scientific fields and has presented each concept in a manner to emphasize its use in several fields.

His opening chapters develop a general foundation in complex numbers, infinite series, differential equations including the Bessel and Legendre solutions, and partial differentiation. These methods are then applied to the analogous physical relationships of mechanical vibrations and electrical oscillations. He presents Lagrange's Equations and applies them to mechanical systems in motion. Vector analysis is applied to electrical fields.

The mathematics of wave motion, heat flow, fluid flow, and sound waves are developed from the general wave equation. Electromagnetic theory is analyzed extensively. The book closes with complex variables, transformations, and stability criteria which constitute tools of aerodynamics, electronics, and similar fields of engineering. Each subject is introduced with the fundamental general case, out of which the special cases and theorems peculiar to different fields are developed.

This book is well suited as a textbook in mathematics for upper class and graduate students of physics and engineering. Its problems and references from many fields of physics and engineering should make it valuable, also, to practicing engineers and physicists for reference and self-study.

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TECHNICAL LITERATURE

Telephones—Monograph 2002 and 2004 have recently been released by the Bell Telephone Laboratories Inc, 463 West St, New York 14, N. Y. No 2002 contains such articles as "Experiments in the Mediation of Electric Arcs" and "Electrode Reactions in Glow Discharge" and is entitled "Discharges at Electrical Contacts." "The type-o Carrier System" is the designation of 2004. Write the company for further information.

X-Ray Spectrograph Chart—A new X-Ray Spectrograph Chart showing characteristic secondary x-ray beams for elements for Sodium (Atomic #11) to Uranium (Atomic #92) is available gratis from the Research & Control Instruments Division, North American Philips Company, Inc, 750 South Fulton Avenue, Mount Vernon, New York. The new chart is suitable for wall display and will greatly assist scientific personnel in understanding the theory and principles of X-Ray Spectrography and will be useful in handling actual problems. Copies available.

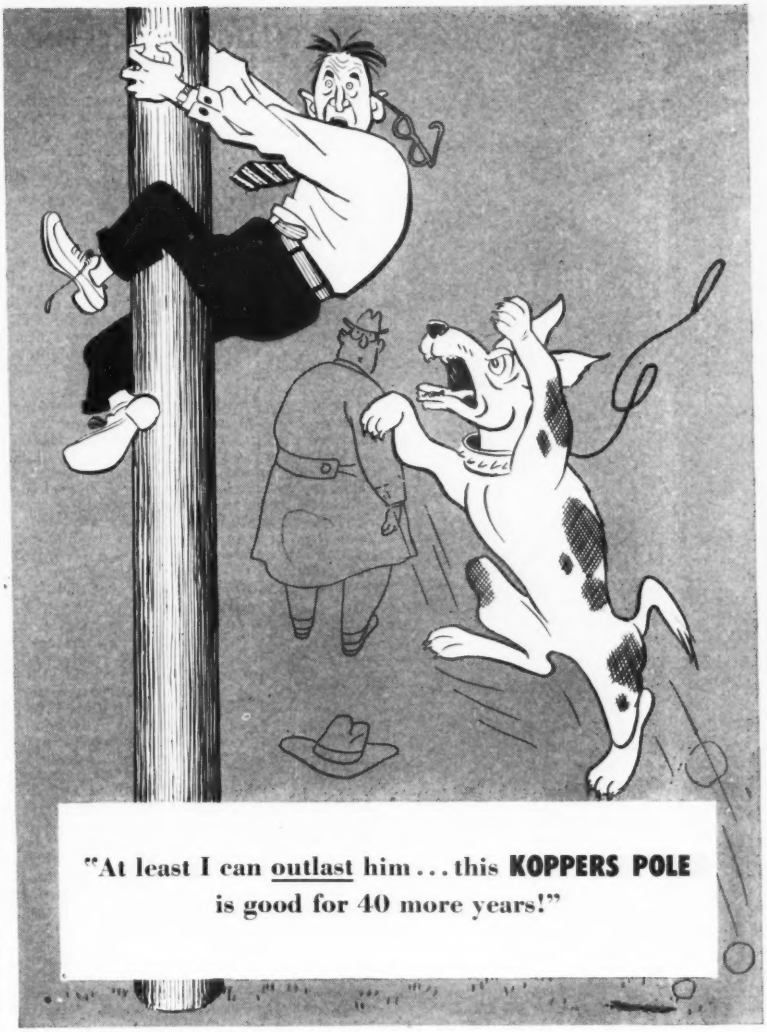
Fluorescent luminaries—A series of two- and three-lamp fluorescent luminaries for surface mounting are illustrated and described in two-color 8 pg folio. Designed for single or continuous mounting, these units are available with either louver or diffusing glass shielding, with or without luminous side panels. The folio lists detailed specifications on these direct-type luminaries, with dimensioned drawings of the top and end views for two- and three-lamp use. For each basic fixture type, the candlepower distribution curve is given for glass or louver shielding. Coefficients of utilization are also included. Copies of Folio No S-50 are available from Gruber Lighting, 125 South First St, Brooklyn 11, N. Y.

ASTM Standards—Committee D-13 on Textile Materials has compiled a book of specifications, tolerances, methods of testing, definitions and terms of textile materials with related information. Copies of this 660 pg book, heavy paper cover, may be obtained by writing to the American Society of Testing Materials, 1916 Race St, Philadelphia 3, Pa. The price is $5.00 per copy.

Rectifier and Thyratron Tubes—A treatise on the history and application of hot cathode gas-filled rectifier and thyratron tubes has just been published by Electrons Incorporated, 127 Sussex Ave, Newark 4, N. J. Copies are available.

Instrument-Transformer Accuracy—A new 16-pg brochure "Instrument-Transformer Accuracy Standards," to facilitate the selection of proper instrument transformers for any particular application, has been announced as available by the General Electric Company, Schenectady 5, N. Y. Designated as GET-1366A, the publication lists accuracy standards for potential transformers, metering current transformers, and relaying current transformers. Diagrams show graphical equivalents of American Standards Association Accuracy classes.

Insulating oils—This symposium is the latest in a series, evaluating the results of comprehensive studies on insulating oils, started 7 years ago by Subcommittee IV on Liquid Insulation of ASTM Committee D-9. There are 19 different laboratories participating in the testing of periodic samples of insulating oil from 18 large power transformers in actual service. This is the fourth Insulating Oil Symposium, the first having been published in 1946, second in 1947, and third in 1949. Copies of this 48-page symposium may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa, and is priced at $1.00 per copy.



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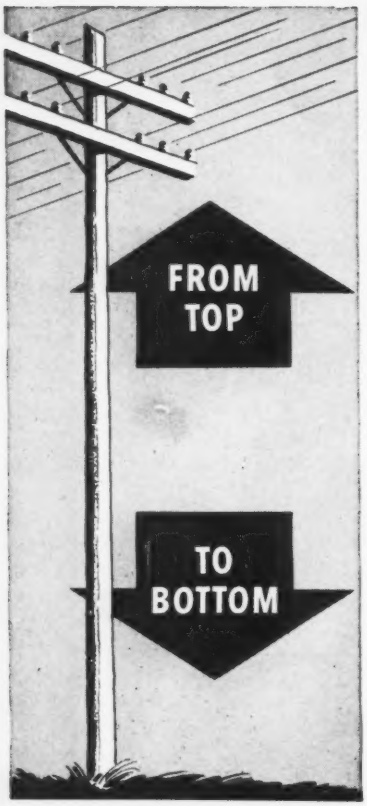

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CATALOGS • BULLETINS

• **METALLIC RECTIFIER POWER CONVERSION UNITS:** A new two color booklet describing a complete line of metallic rectifier power conversion units has been announced as available from the General Electric Co, Schenectady 5, N. Y. Containing illustrations this 8 pg booklet may be obtained easily, by writing to the company.

• **LEVER CONTROL:** No F 101, a new 8 pg, 2 color brochure describing applications, features, and various types of electrodes may now be secured from the Felden Instrument Div, Robert Shaw-Fulton Controls Co, 2930 N 4th St, Philadelphia 33, Pa.

• **CONTROL PANELS:** The engineering and economical planning of modern combustion and process control panels is discussed in a new 8-pg bulletin, No 170. Numerous panel designs, fashioned for control, are illustrated along with the most up-to-date methods of tubing and wiring. A section on panel accessories of utility and appeal combine to make a valuable source book of ideas for control station planners. Write Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio.

• **TRANSMISSION:** A new catalog, now ready for distribution describes completely the pneumatic, magnetic, electric, electronic, and electronic-follower transmission systems for use in measurement and control of flow, pressure, liquid level, viscosity, and specific gravity. The booklet is profusely illustrated containing performance characteristics and schematic diagrams of the various systems. Copies of catalog T-50 may be obtained free of charge by writing to the Fischer & Porter Company, 7250 Jacksonville Road, Hatboro, Penn.

• **REGULATORS:** Catalog 29 describes the new constant pressure differential regulator, and the new instrument air pressure regulator. The constant pressure differential regulator is a compact unit consisting of the air pressure regulator and a new phenolic body purgerator meter piped together on a bracket for wall mounting, or with a bezel which permits front or rear panel mounting. The instrument air pressure regulator was developed especially for internal case mounting with the P-4 pneumatrol pneumatic controller series. Copies may be obtained free of charge by writing to Fischer & Porter Company, 749 Jacksonville Road, Hatboro, Penn.

• **CAST PLASTICS:** Optically clear rigid plastic sheets of Cocor CR-39, CP-1, and CO-3, as well as CP-2 UHF insulation sheet and rod, are featured in a new 8 pg illustrated bulletin just published by Cast Optics Corporation, 1 Post Road, Riverside, Connecticut, and is now ready for distribution. The catalog contains descriptions and tables of properties of four Cocor cast plastics, lists of features, brief fabrication instructions, and some of the accepted uses. Write the company for further information.

• **AUTOMATIC CONTROL:** The Research Department of the Lindberg Engineering Co, 2450 W Hubbard St, Chicago, Ill, has released a data sheet describing their device to automatically control and record the carbon potential of furnace atmosphere. Write H. W. Bluethe, Sales Promotion Manager of the company for additional information.

• **VENTILATING EQUIPMENT:** The Swartwout Co, 18511 Euclid Ave, Cleveland, Ohio, announced a new bulletin on the company's autronic temperature transmitter. Consisting of 4 pgs, the bulletin is illustrated with photographs, line draw-

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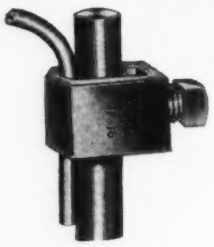

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• Write for our 1953 catalog and price list of over 60 different gases, and compressed gas equipment. For Technical information please address your inquiry to Mr. A. L. Mossman of our Gas Mixture Division.

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ings and schematic diagrams showing principles of operation. Copies of A-706 are now available.

● **SIGNAL RELAY UNIT:** For information about model "LPC", Tel-Alarm Relay write the Tigerman Co, 4332 N. Western Ave, Chicago 18, Ill. The unit fulfills a wide range of applications for economical and reliable signalling service.

● **SOLDERING:** An illustrated brochure, entitled "The New Way to Solder," is currently available from the Wasserlein Mfg Co, Inc, 126 W Cass St, Joliet, Ill. It explains resistance soldering and outlines its many uses for production and maintenance. To secure a copy write the company.

● **METALS:** A new 12 page color bulletin has recently been released by the Metals and Controls Corp, General Plate Division, Attleboro, Mass. covering such items as composite metals, precious metals and electrical contacts the catalog can be had by contacting the company.

● **PULP AND PAPER:** A two color, 20 pg catalog describing measurement and control instruments for the pulp and paper industry has been released by the Fischer & Porter Co, 7240 Country Line Rd, Hatboro, Pa. Complete information on flow level consistency, specific gravity and viscosity measurement is included along with photographs and diagram. Write the company for information about this Bulletin A-130-1.

● **CATALOG DIGEST:** An indexed selection booklet is now available through the Ohio Injector Co, Wadsworth, Ohio. It also contains useful pressure temperature rating charts and charts for both forged and cast steel values in addition to pressure temperature chart for composition disc application in bronze and iron values.

● **INSTRUMENTS:** Bulletin No 99 describes new miniature variable speed changers weighing only six ounces. Copies of this catalog will be sent upon request to the Metron Instrument Co, 432 Lincoln St, Denver 9, Colo.

● **CORDS, TAPES AND SLEEVINGS:** Cotton glass and asbestos woven tapes, braided sleevings and cords for electrical insulating purposes are fully described in a new free 28 pg catalog. Copies may be obtained from the Publications Department, Insulation Manufacturers Corp, 565 W. Washington Blvd, Chicago 6, Ill.

● **PRECIPITATOR:** A 4 pg bulletin with information arranged for a quick understanding of the features of the electrostatic precipitator for the paper industry has been announced by the Research Corp, Bound Brook, N. J. Diagrams and complete cut-away views of this equipment is shown.

● **ELECTRIC HEATERS:** Chromalox electric comfort heaters of every type, size and rating are described in D-52, a new 8 pg catalog. Listing 75 different models of forced air connection and radiant heaters in capacities of ¼ to 100 kilowatts it can be obtained by writing to the Edwin L. Wiegand Co, 7513 Thomas Blvd, Pittsburgh 8, Pa.

● **ALUMINUM:** "Welcome To The General Sales Office" is the title of a new 28 pg booklet published by the Reynolds Metals Co, 2500 So Third St Louisville, Ky. The booklet wil be sent without charge upon request to Desk 4521 at the above address.

● **DEMINERALIZATION:** A 30 pg brochure on demineralization including silica removal has recently been published by the Permutit Co, 330 W 42nd St, New York City, N. Y. Copies of this new literature may be secured by writing to the company at the above address.

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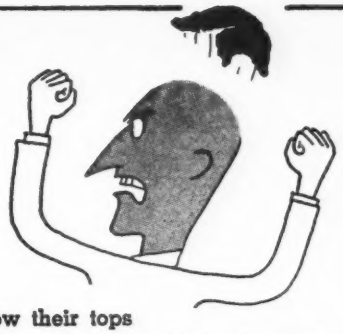

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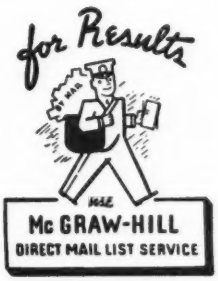

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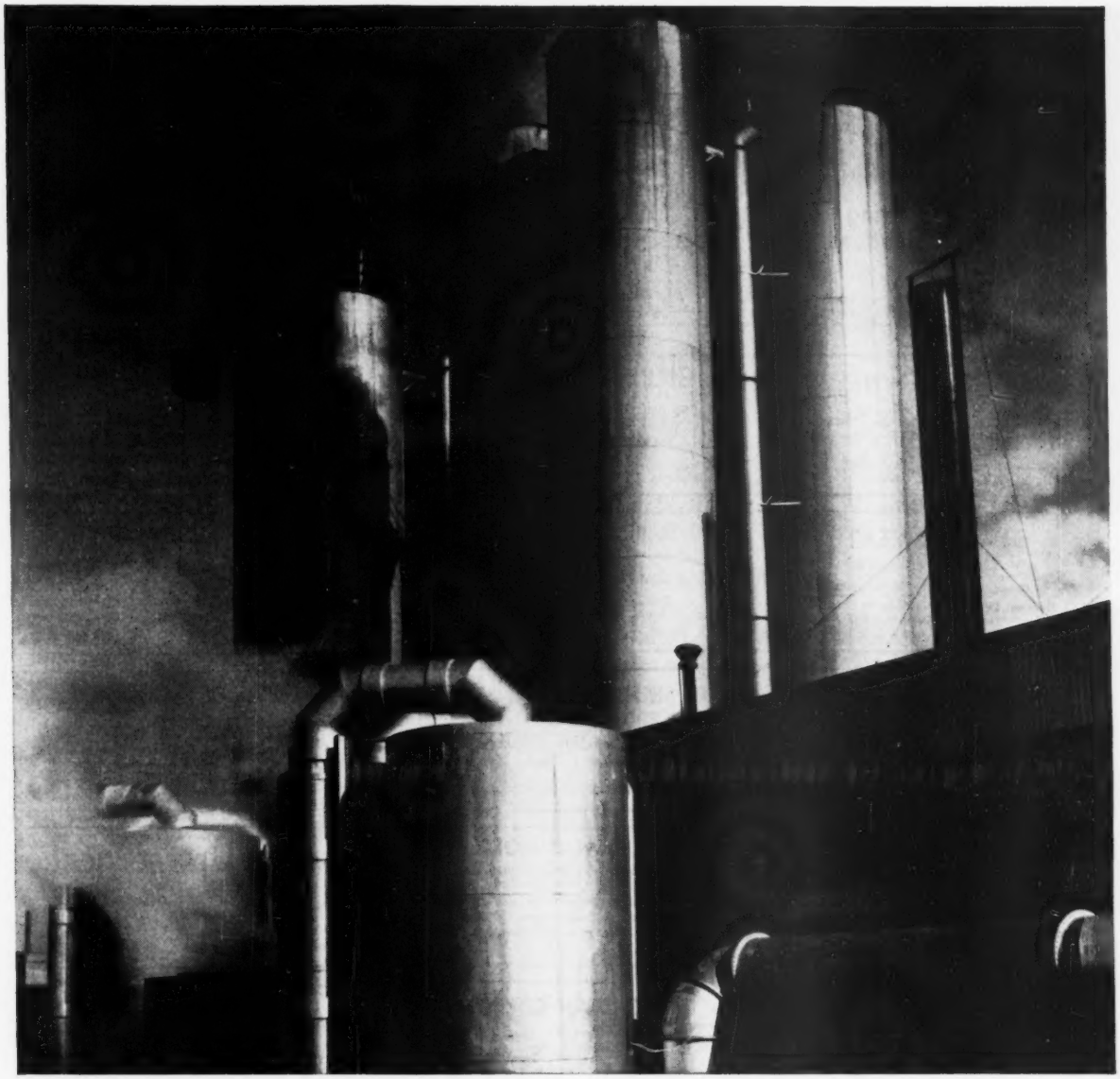

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1000	West. (3-unit)	11000	137½/275
500	A.C.-Westgh.	2300	250
500	Cr.-Wh.	220/440	250
450	G.E. (3-unit)	2300	125/250
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250	Westgh.-G.E.	440	250
200	Ridgeway	220	250
150	G.E.	2300/440	250
150	G.E.	2300/4000	125/250
150	G.E.	440	275
100	G.E. (25 cy)	440	125
100	G.E.	2300	250
100	Delco-G.E.	440	120/240
90	G.E.	440	60
75	A.C.	440	250
60	A.C.	2300	110
60	G.E.	440	250
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40	A.C.	220	125
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25	Westgh.	2200	125

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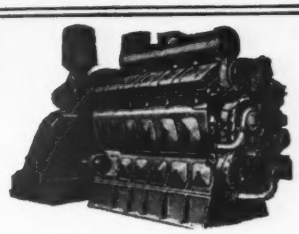

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1136	Fairbanks Morse	38D	1600	720	320	Enterprise	10G-6	550	450
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	480	1200
1000	General Motors	16-567B	1440	720	250	Fairbanks Morse	37-E	375	360
750	General Motors	12-567	1080	720	200	General Motors	8-268A	300	900
800	Baldwin	VO-8	750	514	100	Worthington	8B-5	150	600
400	General Motors	8-278A	750	720	100	General Motor	3-268A	150	1200
600	General Motors	8-567	720	720	60	General Motors	6-71	90	1200
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FROM AVAILABLE STOCK

TURBO GENERATORS IN STOCK

Qu.	KW	Make	Desc.
1—	1000	G.E.	Non-Cond—190 lbs—2400-3-60
1—	1000	Moore	Condensing—Extraction—190 lbs., 2400-3-60—Surface Cond.
1—	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1—	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter
1—	400	Westgh.	Non-Cond—125/150 lbs., 5/10 lbs. B.P., 240/480-3-60
1—	300	G.E	Non-Cond 150/175 lbs., 5/10 lbs. B.P., 480-3-60

FREQUENCY CHANGERS

KVA	Make	RPM	Voltages	Frequency
1—3750	G.E.	300	2400/4150-2400/4150	25/60/25
1—3125	G.E.	300	2400/4150-2400/4150	25/60/25
2—2500	G.E.	750	2400/4150-2400/4150	25/62½/60/24

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu.	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6600/13200
2—	2000	G.E.	500	666	25 cy. 11000
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
3—	1500	G.E.	514	250	6600/13200
3—	1500	G.E.	600	600	2300/4150
1—	1000	G.E.	900	260	4100/6900
2—	1000	Whse.	900	600	2300/4158
1—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
3—1250	G.E.	HVDDJ		6600x550
1—1150	A.C.	OISC		13200x480/2400
3—1000	G.E.	HVDDJ	1	2200x480
5— 300	G.E.	HT	3	2400x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St. Jersey City 6. N. J.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
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TRANSMISSION LINE
MATERIALS

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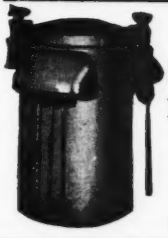
EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

—TRANSFORMERS—



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We rewind, repair and redesign all makes and sizes. One Year Guarantee.

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TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V. 2300V Pyranol
2— 750 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
2— 400 KVA Pitts., 1 Ph., 2400/4800V. 240/480V.
3— 333 KVA Whse., 1 Ph., 2400V. 600 V sec.
2— 200 KVA G.E., 3 Ph., 4150V. 120/240V. sec.
1— 200 KVA G.E., 3 Ph., 2400-220 Sec.
3— 100 KVA Whse. 1 Ph., 13,200V—220/440.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM. 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G. E., 1800 RPM. 220V. 3/60
2— 150 H.P., Al. Chal. 360 RPM. 440V. 3/60

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V 720 RPM, 4000 Syn.
1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V. 900 R.P.M., 220 V Syn.
1— 175 KVA West., 1Ph., 220V. Motor 3Ph., 440V.
1— 150 KW G.E., 126/250V. 1200 RPM, 2300 Syn.
1— 100 KW G.E., 250V. 900 RPM, 2300V. Syn.

SLIP RING MOTORS

1— 400 H.P. West. CW. 450 RPM 550V.
1— 250 H.P., West., CW, 600 RPM, 440V.
1— 200 H.P., West., CW, 600 RPM, 440V.
3— 150 H.P., Al. Ch. 1800 RPM, 2300V., 3Ph. 60 Cy.
1— 100 H.P. G.E., MT 600 RPM 440V.

Large Stock of A.C. and D.C. Equipment

Cole Electric Co.

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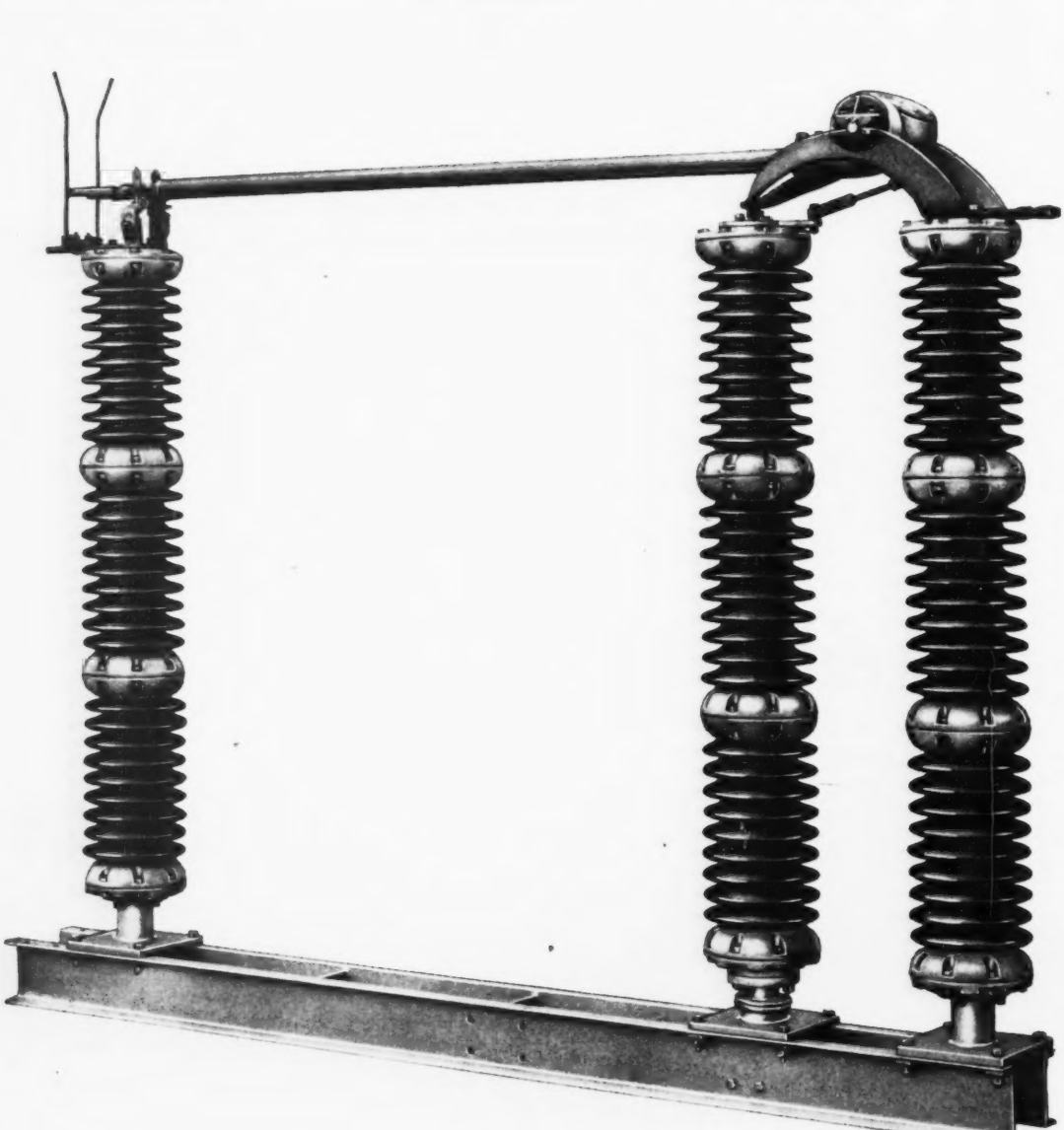


AIR BREAK DISCONNECTING SWITCH

161,000 Volts—600 Amperes—Type 0-2

Horizontal Mounting—Three Pole—Single Throw—Group Operated

SILVER TO SILVER CONTACTS

One Pole Shown

See Bulletin 46A

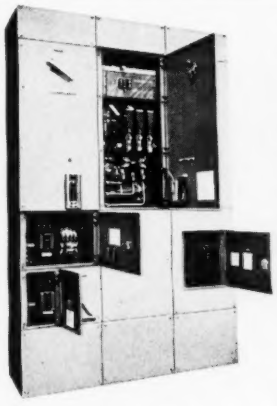
5 reasons why these new users chose

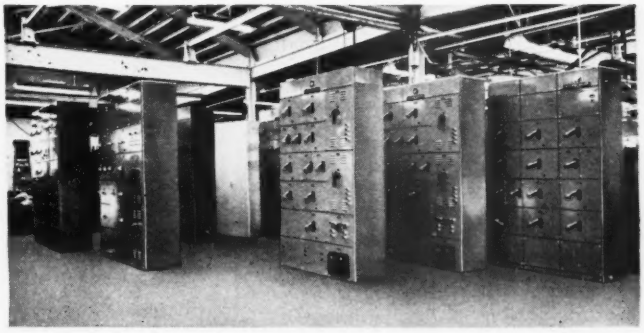
FEDERAL NOARK® CONTROL CENTERS

1—Low installation costs. **2**—Savings in maintenance costs. **3**—More efficient use of plant area.
4—Maximum safety. **5**—Unlimited flexibility.

PARTIAL LIST OF RECENT CONTROL CENTER INSTALLATIONS

	OWNER	LOCATION	ENGINEERS
UTILITIES	Minnesota Power & Light Co.	Duluth, Minn.	H. Carpenter, Duluth, Minn.
	Cambridge Electric Light Co.	Kendall Square Station, Cambridge, Mass.	Gilbert Associates, Inc. Reading, Pa.
	Manila Electric Co.	Manila, Philippine Islands	Gilbert Associates, Inc. Reading, Pa.
	New York State Electric and Gas Co.	Dresden, New York	Gilbert Associates, Inc. Reading, Pa.
	Central Illinois Public Service	North Hutsonville, Ill. Power Station	Sargent & Lundy, Engrs. Chicago, Ill.
	Illinois Power Company	Hennepin, Ill. Power Station	Sargent & Lundy, Engrs. Chicago, Ill.
	Montana-Dakota Utilities	Sheridan Steam Power Plant	Stearns-Rogers Mfg. Co.
	Kleenburn, Wyoming	Sheridan, Wyo.	Denver, Colo.
	Union Elec. Co. of Mo.	Meramec Plant St. Louis County, Mo.	
	Empire District Electric Co. Kansas City, Mo.	Riverton, Kansas	Black & Veatch, Kansas City, Mo.
DEFENSE INSTALLATIONS	United States Atomic Energy Commission	Medical Research Lab. Los Alamos, N. M.	Black & Veatch Kansas City, Mo.
	National Advisory Committee for Aeronautics	Flight Research Lab. Langley Field, Va.	The Austin Co.
	United States Atomic Energy Commission	Hot Semi-Works Radio Chemistry Building Richland, Washington	General Electric Company
	U. S. Naval Amphibious Base	Little Creek, Va.	N. A. C. A., Langley Field
MEAT PACKERS	Geo. A. Hormel Co., Austin, Minn.	Fremont, Nebraska	
SEWAGE DISPOSAL PLANTS	City of Fairfield, Connecticut	Sewage Plant Fairfield, Connecticut	
	City of Camden, New Jersey	Baldwin Run Sewage Plant Camden, New Jersey	Havens & Emerson Consulting Engineers
INDUSTRIAL AND CHEMICAL PLANTS	Clean Coverall Supply Co.	St. Louis, Mo.	
	Missouri Portland Cement Co.	St. Louis, Mo.	Guarantee Elec. Co. Horner & Shiffrin, Engrs.
	Dow Chemical Co.	Madison Magnesium Div. Madison, Ill.	Giffels & Vallet, Inc. Detroit, Mich.
RECLAMATION SERVICE	Corps of Engineers, Dallas, Texas	Whitney Dam Brazos River, Texas	Corps of Engineers Dallas, Texas
COMMUNICATION AND TRANSPORTATION	Fort Worth Star Telegram	Station WBAP-TV Fort Worth, Texas	Yandall, Cowan & Love Fort Worth, Texas
	Terminal Railroad Association	Union Station, St. Louis	Electric Service Co., St. Louis





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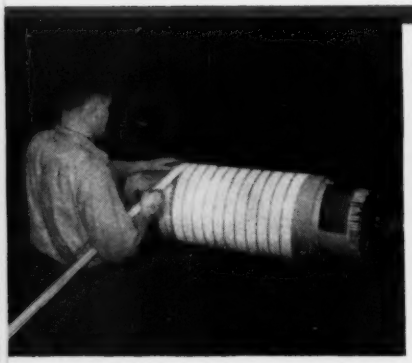
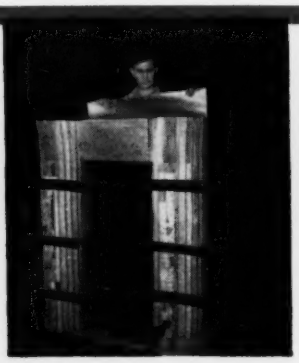
This is how *Kuhlman* craftsmanship assures you dependable transformers

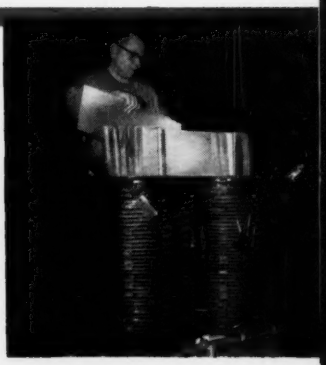


1. The coils of Kuhlman power transformers are usually wound concentrically. Coils that are to carry heavy currents at low voltage are of the interleaved disc type. Above, a cylindrical LV core for a 1000 KVA transformer being wound with multiple wires transposed when necessary to maintain low stray losses.

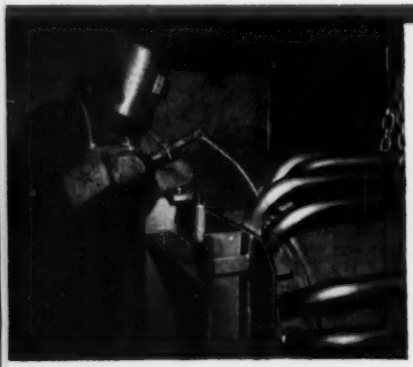


2. Assembling the core for a 1000 KVA transformer. After the assembler has finished inserting the laminations, the core will be inverted to receive the coils. The laminations are made of cold-rolled oriented silicon steel which permits the flux path to follow the grain of the steel producing high permeability and low hysteresis.

3. Here the core has been inverted and assembled to the lower part of the core clamp. The coils, which have been immersed in a thermo-setting varnish and baked, have been slipped over the legs of the core. The assembler is bracing the core to prevent shifting and vibration.

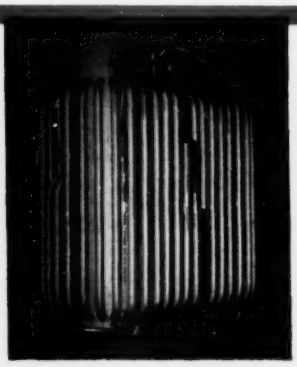


4. After the core has been braced, the assembler inserts the necessary laminations on top to complete the core. After this, the remainder of the core clamp will be assembled and the core and coil assembly will be ready to be lowered into the tank.



5. The tank is made of heavy steel plate, electrically welded at the seams. Here you see the cooling tubes being welded on the outside of a tank to provide oil-tight and rust-proof joints.

6. In this picture, the welded joints of the cooling tubes are being tested for leaks. After these tubes are put on the tank, the entire tank is filled with kerosene and subjected to air pressure as a final check to determine if the tank is completely oil-tight.



7. Finally, the entire tank is shot-blasted and painted with a coat of rust-inhibitive primer and two coats of corrosion resistant paint. The tanks are then ready to receive the core and coil assembly.

8. Kuhlman transformers are engineered for long life and dependability. They are built from carefully selected materials according to sound principles of design and assembled with infinite care and patience by skilled craftsmen with years of experience at their job. Then each transformer is thoroughly inspected and tested for safe, efficient performance. When you install your next transformer, specify Kuhlman for transformers of outstanding quality — backed by nearly 60 years of electrical manufacturing experience. Write us today for the name of your nearest Kuhlman representative.

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CRYSTAL SPRINGS, MISSISSIPPI

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